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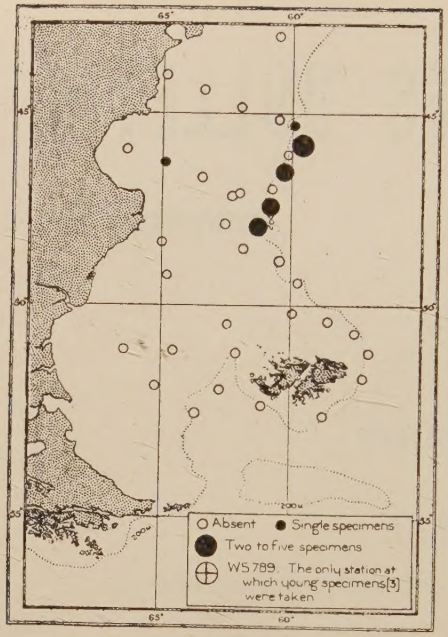

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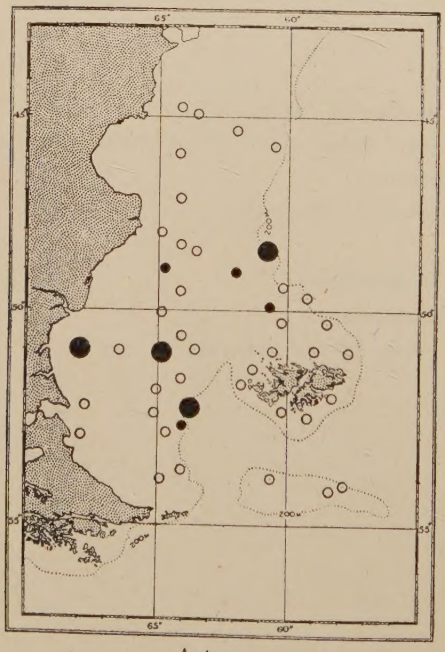

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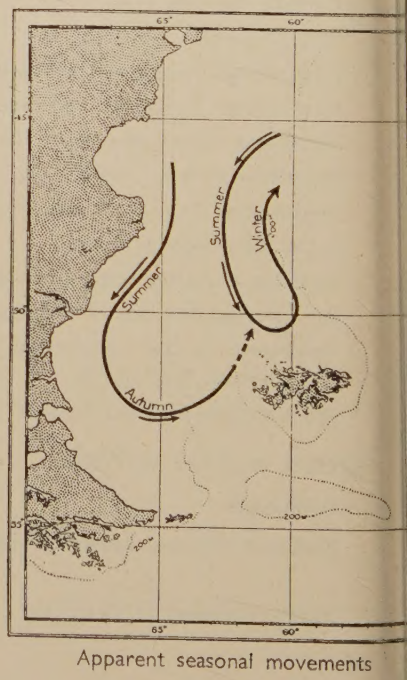

Apparent seasonal movements

Working charts of distribution of the species known as 'ling' or 'rockling' in New Zeala
from data collected during surveys by the R.R.S. *William Scoresby* on the Patagonian Sh
(see *Discovery Report* Vol. XXIII,). These surveys were a model of exploratory fishing, includ
basic studies of the topography of the shelf, hydrography and plankton, use of several ki
of well described fishing gear, and detailed biometric examination of the catches.

EXPLORATORY AND EXPERIMENTAL FISHING *

I. Beginnings

" An early day of the ensuing week will witness the departure of the most important naval surveying expedition which has been sent forth by any country. " Thus *The Times*, London, began a detailed account of the program of work to be undertaken by H. M. S. *Challenger* during her three and a half year voyage round the world. It has been justly said that in the study of the material collected during those years, from December 1872 to May 1876, the foundations of oceanography were laid. Undoubtedly, the scientific study of the physics and chemistry of the oceans grew from this pioneer work, as did also deep-sea biology, and there are several accounts in which this growth is traced.

One of the principal achievements of the *Challenger* expedition was the demonstration of the existence — in abundance and great variety — of living animals in all seas at very great depths, and the way in which this was done is of some significance to us. Until that time, the matter was still controversial. Strange creatures had been washed up on shores lying close to deep water, various organisms were found clinging to sounding lines or encrusting telegraph cables hauled to the surface for repair. As early as 1818, Sir John Ross had designed and built a snapping grab for sampling the sea floor and had used it at nearly 2,000 m. depth, finding many forms of life ; and after this, dredges were used several times from survey ships. The *Challenger* carried grabs and dredges too, but in addition she had on board a beam trawl exactly similar in build to the trawls used in coastal waters by English fishermen at that time. It was with this gear that most of the specimens of fishes were caught. No special changes wers made to it for deep sea work, but various lengths of beam were tried — 17, 13 and 10 ft. The ten-foot size was found, eventually, to be the most suitable, and it was adopted for use at the many hundreds of stations occupied by the vessel during the expedition.

The testing of different kinds or modifications of fishing gear, the decision as to which is the better for a particular situation and purpose, and the systematic use of that gear to take samples of fish — in these activities lay the germs of modern concepts of fisheries experimentation and exploration. However, in the last decades of the nineteeth century, methods of fishing for bottom-living species were changing rapidly, and the equipment for oceanic survey vessels changed accordingly. The *Challenger's* trawl had been towed by a hemp rope, but within a year of her return, Agassiz, aboard the U. S. Coast Survey vessel *Blake*, was using a steel wire to tow a modified beam trawl in the Caribbean Sea and the Gulf

* By S. J. Holt, Fisheries Biologist, Fisheries Division, FAO, Rome, Italy.

of Mexico. Soon, the newly introduced otter trawl, worked from a steam-powered vessel, was replacing the beam trawl of the sailing smacks in the North Sea and elsewhere, and when, in 1900, the steamer *Michael Sars* was built by the Norwegian Government to "undertake researches in connection with the Norwegian fisheries, and to study the natural conditions on which they depend," it was natural that she too should be equipped with the most effective fishing gear available. Murray and Hjort wrote, in 1912, of the necessity.

> To have a vessel capable of making investigations similar to those carried on by oceanic expeditions, and at the same time suitable for practical fishery experiments, which are every year becoming of more and more importance in the work of scientific research... the size we selected was that of a first class fishing trawler.

Although the method of working the otter trawl was modified because of the desire to fish at greater depths than was customary, the deck arrangement of the *Michael Sars* was essentially that of a typical commercial vessel of the time.

Towing the *Challenger's* net was achieved by allowing her to drift with the wind abeam, and indeed the beam trawl could be used in this simple way from almost any vessel of sufficient size, whereas for otter trawling power propulsion was necessary, and special skills were required for the more complicated shooting, towing and hauling operations. It should be mentioned that the *Michael Sars* was equipped also to use lines and drift nets, as well as the usual apparatus for making hydrographic observations. The building of a research ship capable of performing well all these varied functions, and others besides, still presents important and difficult problems in design (*see* papers on the subject and discussion in Traung, 1955) and for this and other reasons the tendency has been to specialize, using different vessels for studying diverse types of fish and a variety of problems within the field of fishery investigations. Further, although the general fisheries research ship, of which the *Michael Sars* is a classic example, is now more than ever an essential tool of the sea-going naturalist, commercial vessels are taking an increasing part in the scientific study of fisheries.

To see how this came about we must turn from the naval establishments to the fish markets. There were, in 1855, 24 craft working out of the port of Grimsby ; by 1890, there were nearly a thousand. Into this growing center of the British fishing industry came about that time a naturalist, E.W.L. Holt, commissioned by the newly formed Marine Biological Association to enquire into the destruction of immature fish. Within three years Holt was no longer a visitor to Grimsby, but a part of the industry. As well as working in the shore laboratory provided for him by the local fisheries society, and trying to collect reliable statistics on the dock, he made many trips to sea in the new steam trawlers. His part was to begin the study of a sea fishing industry, as it was, and as a whole, just as Frank Buckland had done for

the fresh-water fisheries. This approach is a model for fisheries scientists to this day, though we see it now as the application, in a particular field, of a more general principle, and call it "operational research."

Holt, and others like him, and of his time, were much limited in their work by being able only to observe, without being able to participate in, or control, any part of these operations on board ship. But, with the great interest displayed in the fisheries at that time by the public and by the governments of several countries, it was not long before such men were going to sea in specially acquired fishing vessels and studying, at first hand, the stocks of fish on which these developing industries so precariously depended. The spirit of exploration, of discovery, was there — this came from the link with the great imaginatively conceived ocean expeditions, which were now established as a continuing, if intermittent, feature of civil life and item of government expenditure. Its expression was modified, however, by the work on the fish market. There, the appearance of some strange fish could brighten a day, but the real task lay in the conversations with skippers, the routine of compiling figures, and, most important, the meticulous examination of the landed catch in an effort to coax from it the secrets of the fish stocks. The excitement here came from the piecing together of this great puzzle.

Most of those who were given the task of applying scientific methods to the study of fisheries were trained as biologists, and the natural focus of their attention was the fish itself. Since they could not observe the fish where it lived, they had to catch it first, but when they had done this they were faced with the difficulty, and even apparent impossibility, of distinguishing in the catch characteristics which were derived from the behavior of the fish from those which really reflected the properties of the gear that had been used to take it. Although today we have instrumental aids by which we can watch both the fish at home and the gear in action, the disentangling of these two factors remains a fundamental problem, and, indeed, its importance gives the reason for attempting this review.

Concern for the preservation of immature fish arose from the fear of depleting the fish stocks by fishing them too hard — a fear which persisted among fishermen and fishing vessel owners in spite of T. H. Huxley's assertion, during the International Fisheries Exhibition of 1883, that "probably all the great sea fisheries are inexhaustible." It had been suggested many times that an answer was to avoid the capture of small fish, giving them a chance to grow to a more profitable size. It was, however, not readily agreed that enlarging the meshes of the net would have this desired effect, some believing that in towing, the trawl meshes were drawn tightly together, thus preventing the escape of any fish. It was to try to settle this question that some of the first fishing experiments, properly so-called, were conducted, but the complete answer did

not come quickly. The essence of the problem was to establish a method by which the ability of the net to release small fish could be deduced from examination of the catch, despite lack of knowledge of the sizes of fish that were present on the fishing grounds. This was achieved in the period following World War I, it being shown by a series of different types of experiment that not only did a large-meshed cod end release small fish, but that it did this while the trawl was actually being towed. The results were summarized at a meeting of the International Council for the Exploration of the Sea (ICES) in 1934.

Meanwhile, the North Sea fishermen had another answer to the depletion of their traditional working area in the search for new grounds. They took their trawls first to Iceland, then to more northern waters. What they caught with this gear they quite reasonably regarded as an indication of the abundance of fish, relative, that is, to the abundance on the grounds whence they came and where the gear had been evolved. When, however, as happened at various times, these same vessels and nets were tried in unexplored tropical waters, it was by no means so clear that the quantity of fish caught measured the amount available, even in relative terms. Now the problems multiplied; problems of comparing the effectiveness of various kinds of nets in catching different species of fish; of designing gear to work under new conditions; of finding fish in new places; and of putting each of these in its place in a comprehensive theory of fishing. To solve them calls, above all, for the blending of two kinds of skill: by full and understanding co-operation between the fishermen on the one hand and those naturalists who have the special knowledge of biology and statistical methods needed for the proper interpretation of data obtained from fish catches on the other. Only in this way will the interaction between the living resources of the sea, and man as a predator on those resources, be understood, and ultimately exploited to man's permanent advantage.

II. Looking for Fish

The aim of experimental fishing is to find the *capacity* of different kinds of equipment to catch fish. This capacity is defined in terms of particular kinds of fish — species, sex, size, and so on — and particular operating conditions, which determine the *effectiveness* of the gear in actual use. Exploratory fishing, on the other hand, is the use of gear, the general properties of which are more or less understood, to study the distribution of aquatic resources; or, more strictly, the distribution of those parts of the entire resource in which we have a direct interest — the fish stocks. It is clear that the possibility of carrying out exploration depends upon the results of experiments, though it would, perhaps, be truer to say that it comes from successful trial and error in devising

, gear that is generally effective under a variety of conditions. The reverse argument is equally true : that satisfactory experiments cannot be arranged without some *a priori* knowledge of the fish population on which the gear is to be tested. This is so at all levels of work. Even the simplest trials demand knowledge of the presence of fish in some abundance, but more refined experiments require, for their interpretation, more detailed information about the local variability in distribution, as well as the behavioral characteristics of the fish. Failure to recognize this has, indeed, often led to the hasty presentation of unwarranted conclusions concerning either the resource or the gear. This error can be avoided provided it is remembered always that the catch results from the complex interection of these two things and that the common factor linking the activities of exploration and experimentation is the analysis of catch — its magnitude and its composition.

Although exploration is always purposeful, its aims can be of the most general kind. We have seen that in the early oceanographic expeditions a prime objective in the biological field was the determination of the limits of life itself. As far as fisheries are concerned, general exploratory surveys may be carried out to establish the distribution limits for species and groups of species of potential economic interest. This may be combined with other activities such as hydrographic and bathymetric survey, and indeed it is important that it should be so combined. Just as exploration of any kind is never aimless, neither is it ever entirely random. There are always some clues, some accumulation of facts, which are relevant — or at least supposed to be relevant — to the location of the object being sought, and these are used as a guide in the choice of plan by which the search is made. It is a small step from this to collecting deliberately other kinds of data and attempting, as exploration proceeds, to correlate them with what has been found up to that time.

The main conclusion drawn from this most broad study of marine life is that the oceans of the world can be divided into a number of zoogeographical regions, in each of which there is a typical fauna. Although the exact boundaries adopted for these regions vary a little according to whether the distribution of shore fishes, or crustacea, or some other group, is assumed to have the greater significance, they are basically determined by the dependence of all marine animals on general climatic factors and upon the great ocean movements. The most recent summary of the present position of this work has been made, I think, by Mackintosh (1954), who gives a map of faunistic regions based largely on the work of Ekman. Such a diagram can be of the greatest help in deciding what are the kinds of fish likely to be found in a given area, and it has been used in devising a scheme to divide a world map into unit regions as a practical necessity for a resource survey (Kesteven and Holt, 1955).

The value of the zoogeographical approach is especially evident when papers such as those mentioned heretofore are studied together with that of Zenkevitch (1955). This author attempted to relate the fauna not only to present climates and currents, but also to the geological history of the oceans, and he was in this way able to offer an explanation for the concurrence of faunal composition in widely separated regions. Instances of this similarity are the feeding cycles of the North Atlantic cod and of the Australian flathead (*Neoplatycephalus*). All the organisms involved in the food chains leading to these two fish are of different species, but the cycles as a whole are analogous. There are many other examples. On this basis predictions might be made of other similarities and the existence of stocks as yet undiscovered, for such are the bounds of our knowledge that new and unexpected populations of fish and other valuable organisms are continually being brought to light, and appreciation of the significance of observations or theories of this kind is bound to speed the discovery of latent resources in the oceans.

When we come to consider areas in which specific kinds of fish may be found, it is frequently necessary to refer back to compilations such as Bartholomew, Clarke and Grimshaw (1911), where maps are given showing the limits of distribution of selected species, genera and families. Buried in the scientific literature, published since those maps were drawn, is an enormous number of notes recording the occurrence of fishes at particular locations. Although attempts have been made to assemble the observations relating to particular species, or places, an effort to do this again on a world scale is urgently required as part of an appraisal, on a similar scale, of the potential value of marine production as a source of food and other materials.

At the same time, it must be remembered that the observation of occurrence for some kinds of fish has only just begun. A particularly important group for which distributional knowledge is still most inadequate is composed of the tropical tunas and similar oceanic fishes. Whereas a trawl or dredge can always be used with a good chance of demonstrating the presence, or absence, of bottom living fish, and efficient equipment has long been available for catching pelagic fish near the coasts and in shallow water, the development of effective methods for catching the tunas over the fullest possible extent of their range has only recently been achieved. This range is one of depth as well as geographical area, and the widespread use of the Japanese long line seems to have been the key factor permitting exploration on the necessary scale, first by Japan and then by the United States of America and other countries fishing in the tropical Indo-Pacific area.

We have so far discussed fishery exploration in the widest sense, as a primarily qualitative study of the presence, or absence, of any commercially useful species. When, however, a specialized gear is used to hunt for desired species, a more appropriate term,

erhaps, is *prospecting*. The tuna investigations as described, for xample, in numerous *Special Scientific Reports* and other publi-tions of the U. S. Fish and Wildlife Service (which include trans-tions of Japanese papers), are, in this sense, to be regarded as rospecting expeditions conceived and carried out on a very great ale. As well as having a clearly defined object, it is characteristic prospecting that searching starts from a center and gradually orks outwards from it, that this process is not haphazard ut that clues are continually followed up, and that there is an nterest not simply in the existence, but also in the quantity of sh. This interest is frequently expressed in the reports by re-erence to the location of "paying quantities," though the level f abundance that yields a profit when it occurs nearby may be uite inadequate when one has to sail a thousand miles to reach . In practice, the economic evaluation is very rarely made; what usually meant, in effect, is "that quantity (per time spent shing) which would pay if it were obtained on the familiar grounds."

With pelagic schooling fishes such as tuna it might be thought hat the distinction between occurrence and quantity would not, erhaps, be so important as with ground fish. But although where here is one such fish there will, probably, be many more, never-heless, the density and size of shoals decrease towards the edges f the distribution of a species, and the proportion of the total area ccupied by the species that is worth exploiting may be increased y technical improvements in gear and economies in its operation. or the rational expansion of a fishery by extension of the range f operations, it is clear that analytical separation of these three actors of cost, gear efficiency and abundance is a necessary step. his is achieved for the abundance factor by finding the correct easure of the effort put into fishing. This measure is divided nto the catch to give a standard index of abundance. In this onnection, it is found that while the absolute density of a fish opulation is usually very difficult to assess, some relative measure f the abundance, a proportional index, will usually suffice for the nitial decision as to whether a concentration, once found, is worth shing. Far more information is needed before it can be said with hat intensity of fishing, and for how long, it will remain worth-hile, and the opportunity for getting much of this information t the most favorable time — which is right at the beginning of xploitation of the new ground — is often missed. From a know-edge of the age-composition and sizes of the fish on the virgin rounds, in many cases, it could be predicted at what rate abun-ance would decline once fishing began and at what level it would e maintained with a given amount of fishing.

The possibility of obtaining this additional information is iven us by the trend in the organization of prospecting activity hroughout the world. This was at first the province only of the ndividual, commercial fishermen and, to a great extent, it re-nains so. It is when fishing is good that time and money can

best be spared to make what might well turn out to be quite fruit less voyages to more distant grounds, but so long as all are makin a good living few will take the risk of leaving the productive ground to the others, and go to look for greater rewards elsewhere. Th common incentive to the search for new grounds has been lac of fish on the old ones, and the tremendous spread of the Euro pean trawling industry at the end of the nineteenth century an the beginning of the twentieth took place largely in this way Later, when the fishing industry had organized itself, the sam incentive led associations of owners and fishermen to seek the assis tance of the governments in financing exploratory voyages Hickling (1928) reports one such arrangement, by which the Fleet wood Fishing Vessel Owners' Association and the Developmen Commission of the United Kindom jointly sponsored two voyage of a commercial trawler, with the specific object of extending th areas available for hake fishing in the Atlantic off Northern Ire land and the northwest of Scotland, and thus giving some relief t the heavily worked grounds. The voyages were partially successfu in that some new grounds were found, and useful relations were noted between the apparent abundance of hake, the depth of wate and the presence of spawning concentrations of fish on which th hake were feeding.

The trend in Europe up to the present time has been for fishery research vessels to carry out any systematic prospecting that in volves observations made additional to the fishing itself. In North America, there has been a further specialization of function in that separate vessels are commonly used for exploration and for other kinds of research. The exploratory fishing vessels are the dominant feature of the tropical tuna research program, and it seems that for some time almost all research will be directed to this end.

Elsewhere, the matter has followed a different course. In Australia, prospecting has, on the whole, first been carried out by the Government and then sometimes followed up by fishing companies (Blackburn and Rayner 1951). Houston (1954) has summarized work undertaken in the Great Australian Bight. This has mostly been straightforward fishing with otter trawls, the principal question being whether trawling would be an immediately paying proposition, and answered by comparison with the results of commercial trawling in other Australian waters. No attempt has been made to relate the catches with the hydrographic or biological feature of the area. Liu and Chen (1952), on the other hand, in a review of prospecting carried out in the South China Sea, mention measurement of a very large number of oceanographic and meteorological factors, but these are listed without being related to the success, or otherwise, of the operations, and yet recommendations are made as to the need for fishing the grounds in a certain way without reference to the economic factors involved.

Very many of the earlier papers report surveys which are obviously inadequate — two or three hauls at a likely looking spot —

and in these cases there was clearly little incentive to pursue the matter. In general, hardly any of the literature on "trawling tests," as they have been called, reads encouragingly and one suspects that most of the real advances are made by the fishermen in the everyday course of their work, going a little further out from shore here, fishing a little deeper there. A high price for the catch can give a stronger incentive to such cautious prospecting than the depletion of home grounds, and when the demand is high enough there can be quite spectacular development though of a rather restricted kind. An example is the shrimp fishery of the Gulf of Mexico, described by Springer and Bullis (1952 and 1954). Here can be seen the full fruits of joint prospecting by both commercial craft and government exploratory vessels, since the fishermen have the means and the incentive to explore – the price being high and the rate of depletion of any particular ground being also high, if only temporary – and the exploratory vessels were working in the area from the very beginning of the fishing, observing not only the quantity of catch, but also the changes in its composition.

Blackburn and Tubb (1950), referring to the New South Wales (Australia) pilchard, give evidence of the need "to carry out at times moderately complex pieces of biological research concurrently with survey and technological work on an unfished species," showing how the available occurrence data for the species presented an incomprehensible picture in the early stages of work, until an age analysis was completed and the anomalies thus explained. Again, Sheard (1954) described a particularly interesting prospection in which an opportunity was taken to carry out continuous fishing tests in previously unexploited reef areas in Western Australia, and where not only were gross catches compared, but details of the structure of the virgin population were obtained. This work was being followed up by a repeated survey after four years of intensive commercial fishing.

Similar opportunities to conduct prospecting where results can be of maximum future value, are afforded under the technical assistance programs in underdeveloped areas, and in such programs as that described by Wheeler and Ommanney (1953). A common situation is that local fishermen are working, with several types of gear, what are thought to be the coastal edges of more extensive stocks of a number of different species, and it is desired to extend the fishing range by suitably modifying the existing types of vessel or introducing new designs. Prospecting may then be carried out by using a number of gears suitable, so far as can be known, for catching under the particular conditions encountered the species present. Here, a minute analysis of the catch — the sex, size and age composition, the state of the gonads and various other biological characteristics — can, especially when compared with the corresponding characteristics of the inshore catch, give a good indication of the likely extent of the stocks beyond the fished area, and the limits of fish movement from one ground to another,

as well as the eventual yield that can be expected from that population.

Returning to the conduct and reporting of prospecting operations, two features are notable in a surprising number of cases. The first of these is the very common failure to give an adequate description of the gear used. This, of course, limits rather drastically the usefulness of the work, especially since so few explorations can be regarded as successful in themselves, and comparability with others is most desirable if full value is to be obtained from the expenditure on this rather expensive activity. To facilitate such description, schedules are required of the kinds of information relevant to each type of gear, together with standardization of the methods by which measurements are made. The full range of enquiry necessary for the preparation of such schedules is indicated by comparing attempts made to produce a logical and universal classification and standard terminology of fishing gear (*see*, for example, Burdon, 1952), with the attention paid by bodies such as the International Commission for the Northwest Atlantic Fisheries, and the Permanent Commission of the International Fisheries Convention (1946), to details of measurement of the cod end meshes of trawls used in their areas of jurisdiction. To this must be added the importance, for some kinds of gear, of the exact method of operation, which, therefore, also needs description. Finally, it should be mentioned that "gear" may here have to include the vessel from which the actual fishing apparatus is worked; in fact, the entire fishing unit.

The second common feature, which is related to this last point, is the frequency of breakdown or inefficient operation when vessels are working away from their home grounds. At several times North Sea trawlers have been sent to fish in tropical seas with partially trained crews, and there arises great uncertainty in the interpretation of the results obtained (*see*, for example, Qureshi and Burney, 1952). It might be emphasized that the crew is an important part of a fishing unit and that the obvious difficulty in evaluating the human element must not be allowed to deter attempts to measure it if fish prospecting is to be more than a haphazard activity.

Since prospecting is a search for the relatively permanent features of the local distribution of fishes, it is clear that any systemization of it will involve an examination of the occurrences of fish concentrations in relation to the more permanent, but localized, characteristics of a heterogeneous environment. Perhaps the most important factor is depth. The fisherman, of course, knows that the sea within his working range is not uniformly deep and that year after year the bottom fishes are found in greater abundance at one depth than another, though the picture is complicated by a seasonal pattern of movement. The choice of where he fishes is ultimately limited by the gear he uses. If he is a trawlerman he cannot work where the bottom is too rough; if he has a ring

t he cannot use it properly where the sea tends to be rough equently. All this is obvious, yet to distinguish the behavior fish in concentrating at particular places from the behavior of ar in working better at some places than at others is a major oblem, and a very complex one that makes demands on every nd of knowledge that wehave of the sea, and on every technique at is available to increase that knowledge. Consider, for example, bay that has been worked with trawls for many years, giving fairly steady yield of ground fish. Outside the bay the water ts deeper and occasional trips have been made there with tle success, although a few fish were taken. How is one to set out assessing the prospects for increasing that fishery? The sherman knows that he had difficulty in handling his trawl in the eeper water, and he may think that since he caught something, here must be much more there to be had if only he could find ways nd means. But from traces on his otter boards, he will have en that the type of bottom was different from that in the bay — ne sand instead of mud. He will then consider whether it is orth searching for muddy patches, especially if there are other ndy bays along the coast where fishing is poor. He will have oticed that the fish in the bay seem full of food but, since he ever sees a ripe one, would conclude that these were somewhere lse. To get at them when they have left the bay to spawn, it ay be useless looking for a muddy bottom ; they choose, perhaps, ocky ground for that, and he could only catch them by discarding he trawl and using hook and line. By this piecing together of ifferent kinds of observation, the fishermen in an area may obtain fair idea of the distribution and behavior of the fish stocks on vhich they depend, and for prospecting to be efficiently carried ut, full account must be taken of this accumulated experience, nd the procedure will be fundamentally the same.

But some additional information can be brought into the dis- ussion. This is of two kinds. Firstly, observation may be nade of environmental factors not usually available to the fisher- nan, such as the temperature and salinity of the water, the abun- lance of the animals on which the fish feed, and so on. Secondly, he catches themselves may be examined in a new way. The isherman will have observed that his catches were composed pre- lominantly of small, and therefore young, fish — though it is pos- sible that the small size could in other circumstances have been put down to poor food supply and overcrowding. By a more de- tailed analysis of the age-composition of his catch, the way it chan- ges with the season and between years when the number of boats fishing differed, and the size reached by the fish after each year's growth, it may be possible to say that this stock in the bay is self- contained, that the few fish caught outside are stragglers from it. Morphometric observations might confirm that the fish in this stock had certain racial characteristics that distinguished them from fishes of the same species elsewhere. For those characteristics

to have arisen in the first place, and then be maintained from one generation to the next, there cannot have been much movement between this bay and another. Such conclusions would not, of course, mean that exploration in the deeper water should not be undertaken, but they would not encourage it. On the other hand, the structure of the catch may be such that it was virtually certain that only the margin of a much bigger stock was being exploited. If, no matter how heavy the fishing becomes, the proportion of large fish remains rather high, then it is clear that there is a "reservoir" somewhere; again, detailed analysis of the catches may indicate approximately how big that reservoir is, and a knowledge of the biology and environmental requirements of that type of fish may suggest where the reservoir is to be found.

Hjort (1945) has summarized experience in Arctic waters where a very large number of small isolated grounds were discovered on which Norwegian prawn (*Pandalus borealis*) can be profitably fished. These grounds are all similar in that they are either deep channels or shallows covered with a very fine silt where fishing was formerly considered useless. The study of observations made during the expansion of fisheries, such as those of the North Atlantic, shows that under similar depth, bottom and temperature conditions there is great agreement in the occurrence of the important fish species and in the composition of the catches. An example of the planned use of such agreements is given by Butler (1954) in a short note describing the methods of prospecting for shrimp grounds on the Canadian Pacific coast. The first step in the program was to make a list of suitable localities based upon study of hydrographic charts, knowing that the two most important commercial species are generally found at depths between 30 and 70 fms. Further requirements were that localities with these characteristics should cover several square miles and be fairly level to make commercial trawling possible. The type of bottom at localities with these required characteristics was then determined with the echo sounder, those having a mud bottom being chosen for trial hauls. A similar procedure was followed in the search for the prawn *Pandalus platyceros*, to be taken in traps on rocky bottom between 35 and 90 fms.

The general environmental features governing the distribution of concentrations of the pelagic fishes are not so clear, but they are the subject of active investigation, especially in the case of the tunas. The commercial long line fishing activities of the Japanese in the western Pacific Ocean and, more recently, the work of the Pacific Oceanic Fishery Investigations, United States Fish and Wildlife Service, in the central Pacific region, have demonstrated the presence in these areas of deep-living yellowfin tuna (*Neothunnus macropterus*) and bigeye tuna (*Parathunnus sibi*) of larger sizes than normally taken at the surface (Murphy and Shomura, 1952). In waters adjacent to the equator, this subsurface distribution of large tunas has been found to exist eastward to 120° W. long.,

hich is about 1,700 miles west of the flourishing eastern surface na fishery. These developments gave rise to the question whether or not there may be present in the region of the latter hery, similar concentrations of tunas living at depths which ake them unavailable to present livebait and purse seine fishing ethods. Fishing trials with long line gear have provided idence to support the belief that in the eastern tropical Pacific gion there are large tunas living at depths well below the surface, hose distribution appears to be influenced by features of the eanic circulation rather than by the presence of land masses Wilson and Shimada, 1955). The Pacific Oceanic Fishery Investgations have found a meaningful relationship between the occurnce of tunas and the presence of plankton in their studies of ne distribution and relative abundance of large tunas in the equarial central Pacific ; and from oceanographic studies is beginning o come an understanding of the link between oceanic plankton bundance and distribution, the nutrient salts, and the major quatorial current systems. Whereas the bottom topography of he sea remains almost unchanged from one year to another, the xact positions of the boundaries between different water masses re variable. The variation may be, to some extent, a seasonal ne — an example is the large-scale displacement of the Equatrial counter-current southwards along the coast of Peru from Detember to April — or it may be irregular. Such variability, in fact, provides a special opportunity for testing hypotheses concernng the relation of such boundaries to the distribution of fish, but o obtain conclusive results with the minimum of effort has nessitated some revision of the methods of survey and analysis nvolved. As an example may be cited the development of studies of the temperature conditions in which the Arctic cod may accumulate (Graham, Trout, Beverton, Corlett, Lee and Blacker, 1954). Starting with the conduct of hydrographic surveys over a prearranged grid pattern, there is being developed a technique for following the movement of particular boundaries and relating these to the distribution of fish observed as each cruise proceeds. A hypothesis that a particular type of fish concentrates in water of a certain temperature cannot be tested by observing only water at that temperature ; clearly, it is necessary to see whether those fish do not occur at the same time — even if in different abundance — in waters at other temperatures. But we must go further than this, the important question being whether the concentrations of fish move as the environmental factors change. When this is shown, a relation useful for finding fish has been discovered. There are then two requirements in such investigations which are not always appreciated : negative results deliberately sought in the testing of a specific hypothesis, and changing factors.

Negative observations may be very difficult to interpret when a supposed relation between the abundance of fish and the presence of its food or other organisms is being examined. Thus, some

aggregation of the fish might always be expected where the rat of production of fish food organisms is high, and where the rat of production is high there will also tend often to be a large stan ing crop of plankton and benthic animals. Standing crops ar not always comparable because in some waters, and for some spe cies, the rate of turnover of the producing organisms may be muc larger than at others. But, more important, by active feedin the fish affect the abundance of their own food, so that *locall* the food supply can be very low in the presence of large number of feeding fish. The relation between the physical characteristic of the environment and the presence of fish is of simple caus and effect ; the fish do not significantly alter the temperature o their surroundings. On the other hand, the relation betwee fish and their food is one of dynamic balance, and this introduces a great complicating factor into the analysis of the data. A particular case, the relations between herring concentration and movement, and the amounts of *Calanus* and phytoplankton, is discussed in detail by Cushing (1953).

The chief conclusion that we must reach from examination of material of this kind is that, whereas physical factors may be useful, both in prospecting and in predicting the location of fish at particular times, the use of biotic factors for the latter purpose, though perhaps ultimately more valuable, has, for the moment, to be approached with great care. However, the pressure of need for such guidance in locating moving fish concentrations was found to relax in face of another kind of development. This is the widespread introduction of the echo sounder and other apparatus for directly detecting the presence of fish. The use of these new detection methods has been reviewed in this Bulletin (Cushing, Devold, Marr, Kristjonsson, 1952) and elsewhere, and here it is necessary only to see how they fit into the general picture of fisheries exploration.

The echo sounder has found its place in general exploration, in the discovery of the " deep scattering layer " and the study of the conformation and structure of the sea bed. Its place in prospecting has been indicated earlier with reference to the Canadian shrimp surveys, and it has been used together with hydrographic observations in showing that, in the wide area of sea between Iceland, Jan Mayen Island and Norway, vast populations of herring were aggregated on the borders of " Atlantic " and " Polar " water and that, when this border shifted, so did the herring. The use of the echo sounder, Asdic and other devices, for locating precisely the position of particular fish shoals, is carried out principally by commercial fishermen as a direct aid to their fishing operations, but on several occasions it has been proposed that special vessels should be used for this purpose. Thus, Parrish (1953) has recommended that the entire North Sea should be covered by systematic echo search for herring, although he stresses the difficulties in achieving this.

We have in the last few paragraphs passed gradually from the scussion of prospecting, the search for fishing grounds, to what perhaps, well called "scouting," the search for the moving h themselves. This term has been used principally in connection th the use of aircraft for spotting surface shoals - an exten- n of the masthead look-out — but it designates also a more neral development. This is a trend of increasing division of bor in fishing industries between the finding of fish and their pture, and carrying this division down to the smallest details of e fishing operation. A good illustration of this trend is given Gubienko's (1952) description of the organization of the Soviet rse seine fishery in the Black Sea. There the vessels work in oups under a flag ship which keeps in continuous touch by radio ith the shore establishment. Aerial spottingi s carried on system- ically over the whole basin to supplement the seiners' searching tivity. By such means the fishing activity of the entire fleet co-ordinated. Use of such an arrangement opens up a whole w field of enquiry relating to matters of organization as much s to fishing methods.

In addition to considering the best course over which scout- ng aircraft or vessels should move, and how frequently, there are roblems of the best size of the group of fishing units, and the op- mum distribution of these groups over the total area thought contain shoals. These problems are, given the necessary data, usceptible to mathematical analysis, and the form of some of the olutions required has already been indicated in wartime studies f such problems as aircraft search for submarines and, conversely, lind submarine search for surface vessels (Morse and Kimball, 951). Recent years have seen the clarification of what can be alled the strategy of fishing in the analysis of the relation between he kind and amount of fishing effort, and the yield obtained from tocks on a sustainable basis, together with the economic evalua- ion of these relationships (*see* Graham, 1952 and 1954). A cor- esponding tactical theory of fishing operations awaits development.

II. The Gear in Action

It can be surmised that a logical analysis of fishing tactics will proceed from the view of fish scouting — whether by aerial spotting, echo sounding, or making trial hauls with the gear — not just as the search for particular schools of fish, but as part of the pro- cess of observing the entire pattern of distribution of the stock. The unevennesses in this pattern may be correlated with the varia- tion of certain environmental factors and particular features may be generalized in statistical terms — the frequency and sizes of shoals, the probabilities of their occurrence in certain localities as compared with others, and so on. If the fish were distributed

more or less uniformly, then little better than a random search could be made. If there are marked irregularities, systematic searching is a possibility, but it could only be effective given the possibility of communicating findings between different fishing units. There are then several possibilities for action on this information : the decision being taken separately by each vessel according to the skipper's best judgment, or by, for instance, the leader of a group of vessels. Evaluation of the potential benefit to be obtained by using any particular searching system should be made in absolute terms, which means estimating the mortality rate which would be generated in the fish population by a fleet of a given size using that system, as compared to random search with all vessels working independently. A change in organization is then viewed as equivalent to a change in the technical efficiency of a particular kind of fishing gear, the effects of which are expressed in the same way. Something needs to be said about this, because, as mentioned earlier, questions of fishery exploration cannot be separated from examination of the effectiveness of the gear.

Gear efficiency could be defined absolutely in such terms as the proportion captured of fish that come within the area of action of the gear. The difficulties are that often we cannot easily define the area of action and, if we could, we should in any case not know how many fish entered it in a given time. We, therefore, measure the *fishing capacity* of a unit of fishing gear as a quantity relative to some other unit, by working the two gears side by side, or alternately, on the same fishing ground. The experiment is arranged in such a way that so far as can be judged both gears are sampling the same fish population. When the fishing unit as a whole is under consideration — i. e., the gear proper plus the vessel working it — it is more usual to refer to its relative *fishing power*. The importance of these measurements is that if relative power or capacity is expressed in terms of some well defined and described standard unit, then measures of standard *fishing effort* — the total time that fishing power is actually exerted — can be obtained, bearing a simple relation to the mortality that will be caused in the fish stock by the fishing activity. This is needed as part of the evaluation of the potential yield that the stock can give. The fishing power is, of course, defined also in terms of a particular kind of fish (or even, size of fish) or a certain species composition.

The fishing power of the vessels can be obtained roughly from statistics of commercial fishing operations, if the catch per unit operation (i. e. per hour fishing or per hook set, per fleet of gill nets per night, etc.) is available and the location of fishing is known, provided that sufficient vessels work in company so that their catches can be directly compared (*see* Gulland, 1955). More precise and informative measurements are obtained by *comparative fishing experiments* in which two units deliberately fish together on the grounds and the catch taken is analysed in detail. Such experi-

ments achieve two purposes. Firstly, comparisons may be made between two kinds of unit, such as trawlers and seiners, or motor trawlers and steam trawlers, so that the results can be applied to the standardization of fishing effort statistics. Alternatively, details of operation of a particular kind of gear may be studied by changing it in some relatively minor way and observing the effects on the catches obtained, i. e., on both magnitude and composition. In this way, and with many refinements of procedure, it has been possible, for some gears, to deduce satisfactorily the relations between specific constructional features of the gear (including, for example, mesh size and particular dimensions, such as headline length of trawls), the catches, and the stock on the grounds. This work is still at an early stage of development, but promises much (*see* recent publications of ICES). Both kinds of comparative fishing experiment will be needed in the task of relating fishing power defined in these relative terms to all the design and operational features of fishing gear and vessels. The ideal is prediction of the efficiency of a gear from a description of its construction and operation and the specification of the vessel it is worked from, and in terms of known behavioral characteristics of particular kinds of fish. Not until something of this is achieved, will it become possible scientifically to design gear for the particular requirements that arise as man's exploration and exploitation of the sea proceeds.

Parrish (1951) has given a clear exposition of the principles of experimental design involved, and some of the experience in the North Sea that he related has been repeated in other areas (*see* Taylor, 1953). Although valid statistical methods for analyzing the results of such experiments are actively being developed, the significant aspect of them in the present connection is the great variation in performance from one operation to the next and, from this, the difficulty of drawing sound conclusions without a considerable number of repetitive trials. Just as the determination of the efficiency differences between two gears working, as far as can possibly be arranged, on the same stock makes heavy demands on our resources of statistical methods and experimental design, so the same problems are encountered when we attempt to draw conclusions about the relative abundance of fish at different places, sampled by the same gear.

It is noteworthy that the authors of papers describing comparative fishing experiments frequently mention their collaboration with the crews of the experimenting vessels in the interpretation of the results. It would be expected that the closer the collaboration the more effective it is, and the bringing together of the fishermen's experience and the naturalists' methods is facilitated by a publication such as that by Halme (1955), who has assembled a great amount of information on the behavior of fish in relation to fishing gear.

IV. Conclusion

The theme of this review has been the search for relations between events in the sea, and it seems appropriate to conclude it by stressing the unity of the scientific study of those relations.

Firstly, we have the common origin of exploration and experiment, and their continuing dependence upon each other. In one the living populations are studied, using fishing gear as a standard testing device. To interpret the results, and make them comparable, the construction and mode of operation of the gear must be described, and to do this effectively its properties in relation to the behavior of individual fish must be understood. In the other case the fishing gear is studied, using the population as a test material. It is not so easy to describe the population adequately, but it is nonetheless necessary ; we try to get round this difficulty by comparative experiments, and in doing so we learn a great deal, but ultimately it cannot be avoided. In both exploring and experimenting, the catch is almost the only source of the information sought, and the more closely it is examined, the more is learnt from it. Other sources of data, the exploitation of which is only just beginning, are the new instruments with which we may directly observe the gear in operation and the resource *in situ*. Echo sounding and ranging apparatus have been mentioned, and to them must at least be added underwater photography, television (Sand, 1955), acoustic devices and diving equipment. Important as these developments are, however, they are only accessory to the main work. The final measure of the gear is the catch it can take; of the resource, the catch that can be taken from it.

Secondly, we have exploration and experimental fishing, both in the context of fisheries science. The field is the study of man's operations on living acquatic resources and of the way those resources respond. At an early stage in this study simple, mainly qualitative, observations of natural events were augmented by systematic sampling of catches and of the stocks. Later, as the important problems became evident and were more precisely defined, it became possible to formulate clear hypotheses concerning these events and to test the hypotheses by controlled experiments. It is, of course, this rigorous examination of a previously formulated hypothesis that distinguishes a modern fishing experiment, in which, for instance, two gears are compared with each other, from what is commonly called a *trial*, in which some operation is carried out and the results judged more or less subjectively.

In this class might also be included that special kind of " experiment " which could well be termed *demonstration fishing*, where the hypothesis, though rarely so formulated, is that the sucessful demonstration, by a chosen crew and vessel, of a new method of fishing or a new stock, will cause others to follow suit and an industry to develop.

Recognition of the great variability of results in fishing has drawn attention to the need for sound methods of analysing the catch data. Advanced statistical methods have brought with them the concept of the *null hypothesis*, by which it is first affirmed that there is no real difference between, say, the efficiency of two types of gear, and that any observed discrepancies in their catches are due to chance, and then an experiment is designed in such a way that there will be the best chance of disproving this assumption if it is, indeed, untrue. This procedure makes it harder to " demonstrate " that one gear is an improvement on another or that one fishing area is better than another, but the caution in drawing conclusions that it encourages, is advantageous in the long run. There are many varied experiments now being conducted to which the same principles are applied. These, often, are not concerned primarily with either exploration or gear operation, but the results from them supplement and contribute to the understanding of the problems with which we have been concerned. As examples may be mentioned the licensing of some New England trawlers fishing haddock on George's Bank, to continue to use the old cod end mesh after the general enforcement of a larger mesh (Graham and Premet, 1955), and tagging experiments designed to give data on the migration and local movements of fish and the extent of separation or mingling of different stocks.

This brings us to the third and last general observation. In both the tagging and the mesh experiments the fisherman is asked to take an active part ; in one case, to keep an accurate and detailed record of his operations ; and in the other, to return marked fish that he has caught, together with a certain amount of data concerning the circumstances of capture. These examples could, of course, be multiplied but we have noted that, in no part of this field, is the mutual understanding by fishermen and naturalists of each other's methods of work so necessary and, when it is achieved, so fruitful, as in exploration and in experimental gear studies. In scouting and prospecting the naturalist learns the " signs " — the glint and ripple on the water, the sea birds sitting quietly when the shoals are lying deep, the fish concentrating on the lee of the bank when the wind is in a certain direction. The fisherman learns the sense of those experiments in which a large mesh is used and the marketable fish can be seen swimming away as the net is hauled in. As new relations between events are discovered, the fisherman wants to take advantage of them, and the naturalist, if he is wise, will try to encourage this by simplifying his apparatus so that, for example, " fishing with a thermometer " or with a plankton indicator or a current meter (*see* Carruthers, 1955) is practicable. He will, of course, be careful also continually to check and test his correlations so that the fisherman is not encouraged to waste precious time.

Meanwhile, the sea remains vast and every opportunity of gaining more information about it needs to be taken. Ships cross-

ing the North Sea on regular routes have for years been towing plankton sampling instruments. Thermometers for recording surface water temperatures are being installed in the condenser intakes of many cargo and passenger vessels, and Parrish (1953) has described the use of vessels on commercial shipping lines and long distance trawlers in passage to northern waters, for making regular and extensive echo surveys for fish. Surely these developments would have given some satisfaction to the writer quoted by Merriman (1948) who, in 1873, reviewing Wyville Thomson's book, *The Depths of the Sea*, complained, ".... what may we not expect from the naval equipment of a nation which .... has allowed its vessels and their crews to lounge about the world like the idlers of a village green when they might have been converted into trained explorers without at all impairing their combative qualities ? "

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FAO/ETAP INTERNATIONAL TRAINING CENTRE FOR FISHERY ADMINISTRATORS, DENMARK.

The FAO/ETAP International Training Centre for Fishery Administrators, conducted jointly by the Government of Denmark and FAO, was held in Copenhagen from 29 August to 8 October, 1955. The cost of the Centre was largely borne from a special contribution in local currency to the Technical Assistance Fund and, as a result, extensive travel, accommodation, instruction and demonstration facilities, and personal services, were made available in Denmark. The Director of the Centre was Mr. Frode Bramsnaes, Director of the Ministry of Fisheries Technological Research Laboratory, Copenhagen ; Associate Director was Mr. Colin Beever, FAO Fisheries Division, Rome. The course was opened by Dr. J. Saxild, Chairman of the Danish National Committee on Technical Assistance, in the presence of a large gathering of senior representatives of the Danish Government and fisheries industries, and of diplomatic and consular representatives of the participating countries.

Twenty-one government fishery administrators, representing 18 countries and territories in the Near East, Mediterranean and Central Africa, attended, namely :

Egypt	Riad Koura, Supervisor, Institute of Fresh Water Hydrobiology and Fisheries, Ministry of Agriculture, Department of Animal Breeding and Fisheries, Cairo.
Ethiopia	Gaitachew Bekele, Technical Assistant to Director-General, Department of Marine.
Iran	Ali Sanati, Technical Director of Fish Canning Factory.
Israel	Moshe Aron Shavit, Director, Fisheries Division, Ministry of Agriculture.
Italy	C.M. de Angelis, Official of the Laboratory of Hydrobiology, Rome.
Jordan	Sa'id Lufti Yaseen, Manager, Jordan Fisheries Co., Amman.
Portugal	Manuel Melo Carvalho, Commander, Gabinete de Estudos das Pescas, Lisbon.
Somalia	L. Gasbarri, Manager, Economic Development Bureau. M. C. Hassan, Manager, Office of the Secretary-General A.F.I.S.
Sudan	Mohamed El Yassa Khalifa, Senior Inspector of Fisheries.
Turkey	Haydar A. Aytekin, Economist, Meat and Fish Office. S. Onar, Economist, Meat and Fish Office.
Yugoslavia	L. Kos, Fisheries Inspector, Fisheries Section, Economic Secretariat of Croatia.

British Protectorates

Aden	P. D. Proude, Fisheries Officer.
Gold Coast	G. T. Harrison, Fisheries Officer.
Malta	J. J. Asciak, Controller of Fisheries, Ministry of Posts and Agriculture.
Nigeria, Eastern	C.I. Horsfall, Assistant Fisheries Officer, Ministry of Agriculture.
Nigeria, Western	M. O. Akinruntan, Assistant Fisheries Officer, Ministry of Development.
British Somaliland	R. E. Taylor, Fisheries Officer, Department of Agriculture.
East Africa, High Commission	J.P.C. Greenway, Fisheries Officer, Lake Victoria Fisheries Service.
Uganda	D. H. Rhodes, Senior Fisheries Officer, Game and Fisheries Department.

The instructors comprised a large and experienced group representing various Danish fisheries institutions, services and commercial associations, a number of distinguished experts from neighboring countries, and several FAO staff members. These were :

Denmark

Ministry of Fisheries, Copenhagen.

B. Dinesen, Fisheries Secretary.
G. L. Mourier, Assistant Fisheries Secretary.
J. Nørgaard, Head of Section.
P. F. Erichsen, Fisheries Counsellor.
S. N. Sørensen, Head of Statistics Section.

Inspection Service for Fishery Products.

P. F. Jensen, Chief.
P. Bott, Assistant Chief.
Arne Schreiber, Danish Fishery Counsellor, Berne, Switzerland.

Danish Institute for Fisheries and Marine Research, Charlottenlund.

Dr. Å. Vedel Tåning, Director.
Dr. Aage I.C. Jensen, Senior Biologist.
De. E. Bertelsen, Senior Biologist.
Frøde Hermann, Senior Hydrographer.
Knud Larsen, Senior Biologist.

Fishery Technology Laboratory, Copenhagen.

Frøde Bramsnaes, Director.
Poul Hansen, Scientist.
Knud Nielsen, Scientist.
B. Albertsen, Bacteriologist.

M. Iversen, Head of Section, Department of Statistics, Copenhagen.
Prof. E. Steeman Nielsen, Royal School of Pharmacy, Copenhagen.
Mogens Jul, Director, Danish Meat Institute, Roskilde.
C. J. Rasmussen, Biologist, Danish Trout Farmers' Experimental Farm, Brons.

Tage Sørensen, Economist, Esbjerg.
H. Frendved, Danish Fishery High School, Middelfart.
E. Hertz, Director, Board of Maritime Works.
A. M. Vendsyssel, President, Danish Wholesale Fish Merchants Association.
J. Højsgaard, Chief Engineer, Hundested Motor Fabrik A/S.
Erik Holten, Chief Engineer, A/S Thomas Ths. Sabroe, Århus.

Netherlands

Dr. D.J. van Dijk, Director, Marketing Board for Fisheries Products.

Norway

Prof. G. M. Gerhardsen, Norwegian School of Economics and Business Administration, Bergen.

Sweden

Dr. J. Hult, Director of Fisheries.

United Kingdom

R. G. R. Wall, Fisheries Secretary, Ministry of Agriculture, Fisheries and Food.

International Council for the Exploration of the Sea

Dr. Arni Fridriksson, Secretary-General.

FAO

Fisheries Division

Dr. Ernest Hess, Chief, Technology Branch.
Dr. G. L. Kesteven, Chief, Biology Branch.
F. E. Popper, Chief, Economics and Statistics Branch.
J-O. Traung, Naval Architect.
H. Kristjonsson, Gear Technologist.
J. Fridthjof, Fish Marketing Specialist.
C. Beever, Fisheries Economist.

Additionally, a large number of Danish government officers, fisheries officers and industrialists, assisted the groups during field trips and demonstrations.

The aim of the course was to provide a comprehensive groundwork of knowledge and understanding of fisheries problems, of the responsibilities assumed by governments in regard to the fisheries industries and their development, illustrated by reference to Danish and other governmental services, of methods, equipment and training involved in the modernization and improvement of fisheries undertakings, and thus to promote increased efficiency in the fisheries institutions and services of the participating countries. To this end a series of lectures was delivered, covering the principles and practices in public fisheries administration, the aims and methods of modern applied biological economic and technological research in fisheries, and organization and methods in commercial practice. The lectures were illustrated by an extensive series of demonstration visits to fishing ports, markets, processing factories, public authorities, and ancillary undertakings, where the structure

and operations of the fish trade were observed and explained. Th visits included a two weeks' tour of fishing centers in Jutlan during which several voyages were made in commercial fishing craft and research vessels. One special object was to demonstrat the growth of a modern, highly organized and well equipped fishery industry from the very small-scale operations conducted 50 years ago

Special importance was attached to a series of seminars in which the participants and instructors discussed problems of common interest in the participating countries and the measures which should be tried in order to promote the improvement of underdeveloped fisheries industries.

Excellent living and lecture room accommodation was made available both in Copenhagen and on tour so that the group, the instructors and staff became thoroughly acquainted with each other thereby facilitating the conduct of the training program and increasing the responsiveness of the participants. The latter expressed themselves well satisfied with the program and were particularly impressed by the arrangements made on their behalf by the Danish authorities. They also emphasized individually and collectively the great benefits derived from this opportunity to exchange with each other their experiences of fisheries work in their respective countries — a particularly important aspect of international training centers.

The Centre attracted widespread interest and friendly publicity in Denmark where the group was accorded an enthusiastic welcome and unfailing co-operation throughout the fisheries industry and related government circles. During the course, the Danish Minister of Fisheries, Chr. Christiansen, visited the Centre to observe the progress of the work and to make personal acquaintance with the participants, with whom he lunched. Many others followed the Centre closely, and it became evident that the participants, their countries and especially their fisheries problems attracted keen and friendly interest among many Danish people. The spreading of such experience and this wider understanding of FAO's tasks in underdeveloped fisheries is not the least of the results achieved by the Centre. By this and by the undoubted benefits conferred on a large number of countries and territories the Government and the people of Denmark have rendered a great service to FAO and its members, and one of special practical value in the program of technical assistance in fisheries.

onferences and Meetings

Calendar for 1956-1957 *

1956

nuary	2	Indian Science Congress	Agra
"	9	ECAFE, Inland Transport Committee - 5th Session	Bangkok
"	16	ECE/FAO Group of Experts on Standardization of Salted Herrings	Geneva
"	17	ECE/FAO Group of Experts on Standardization of Fresh Fish and Shell Fish	Geneva
"	25	FAO Inland Fisheries Meeting	Rome
ebruary	13	UN Statistical Commission	New York
"	25	2nd FAO Consultants' Meeting on Documentation and Related Services for Fisheries Biology	Biarritz
ebruary		Committee on Biology and Statistics of the International North Pacific Fisheries Commission	Hawaii
larch	1	International Commission for the Northwest Atlantic Fisheries, Committee on Research and Statistics	Biarritz
"	21	Scripps Institution of Oceanography, Symposium	La Jolla
larch		World Meteorological Organization - 2nd Session, Regional Association (Yugoslavia) VI (Europe)	Dubrovnik
pril	30	American Geophysical Union, 37th Annual Meeting; Symposium on the Antarctic; Meetings in Meteorology	Washington D.C.
pril		International Institute of Refrigeration, IV Commission Meeting	Cambridge
lay	8	Permanent Commission of the International Fisheries Convention (1946) - 5th Meeting	London
"	18	International Fishery Trade Fair	Copenhagen
une	18	3rd International Congress of Distribution of Food	Rome
"	20	International Union for the Protection of Nature - 5th Session of General Assembly	Edinburgh
"	24	FAO Interim Committee on Fish Handling and Processing. Meeting of Fish Processing Technologists	Rotterdam
une		Commission for Technical Co-operation in Africa (CCTA) - Inland Fisheries Meeting	Brazzaville
uly	1	Third South Pacific Conference	Fiji
"	2	International Commission for the North Atlantic Fisheries (ICNAF) - 6th Meeting	Halifax (Canada)
"	16	International Whaling Commission - 8th Annual Meeting	London
"	24	FAO Meeting of the Organizing Committee for an International Committee of Inland Fishery Workers	Helsinki
"	27	International Limnological Congress - 13th Session	Helsinki
August	9	18th International Geographical Congress	Rio de Janeiro

* Ed. Note. All dates are subject to revision.

Calendar for 1956-1957 (*continued*)

September	6	Congress of International Economic Association - 1st Meeting	Rome
"	24	3rd International Canning Congress	Rome/Parma
"	27	International Council for the Exploration of the Sea - Scientific Meeting on Herring " Races "	Copenhagen
September		General Fisheries Council for the Mediterranean - 4th Session	Istanbul
October	1	International Council for the Exploration of the Sea - 44th Meeting	Copenhagen
"	1	International North Pacific Fisheries Commission	Seattle
"	8	FAO Far East Regional Meeting	
Autumn		UNESCO Advisory Committee on Marine Sciences - 2nd Meeting	Peru
November	15	Latin America Regional Meeting	
"	17	International Advisory Committe on Terminology in Pure and Applied Science	
November		Gulf and Caribbean Fisheries Institute - 8th Session	Miami
		Special Conference of Organization of American States (Pan-American Institute of Geography and History - PAIGH)	
		International Union of Geodesy and Geophysics	Canada
		International Union of Microbiology	Ostend
		UNESCO General Conference	New Delhi

1957

	Carribean Fisheries Seminar - 3rd Biennial Meeting	
April/May	Indo-Pacific Fisheries Council - 7th Session	Bandung (Indonesia)
June/July	FAO International Gear Congress and Fishery Biology Congress	Hamburg
November	Latin American Fisheries Council	
	FAO Conference - 9th Session	Rome

Training Centers

1956

October		Training Center for Fishery Technologists in Latin America	Lima/Callao (Peru)
November	1	Training Center for Junior Fishery Officers of South Pacific Commission Territories	Noumea (New Caledonia)

1957

October	Training Center in Fishery Co-operatives in South East Asia	Australia

FAO Conference

The Eighth Session of the FAO Conference met in Rome from 4 to 26 November 1955. As in previous conferences, a Technical Committee on Fisheries was appointed to discuss the work of the Fisheries Division and to report back to the Conference. Mr. J. le G. Lacy of the British Ministry of Agriculture, Fisheries and Food, was elected chairman of the Committee, and Mr. E. Heen, of the Norwegian Directorate of Fisheries, vice-chairman.

Their report was as follows :

The Conference examined the results achieved in fisheries during the past two years, as well as the program of work proposed by the Director-General for the next two years. It commended the Director-General upon the achievement of a program which was well conceived and properly balanced. It felt that future trends in the work on fisheries should be based upon the logical development of the present structure. It noted the necessity for strengthening the staff in order to implement the projects in the 1956-57 program and approved the measures suggested to accomplish this purpose.

It was felt particularly desirable that projects should continue to be undertaken which were consistent with the status of the Organization as an international body, and that member countries should continue to be encouraged to undertake work which could more appropriately be done nationally.

It was considered that, among the activities to be conducted under the Regular Program, those now in progress deserved the highest emphasis and that the danger should be avoided of spreading too few staff over too diverse a range of activities. Importance was attached to the concurrent development of production, processing, distribution and marketing in the domestic fisheries.

The Conference wished to draw special attention to the following aspects of the program of work for the next two years :

Fisheries Biology

In the field of fisheries biology, the Conference considered that the establishment, first of all, of a common terminology and, secondly, a standardization of research methods deserved emphasis, and that the initiative which had already been displayed in this direction should be commended. Such standardization of terms and methods was necessary in order that any one country might utilize the work done by other countries. It was regretted that it had not been possible to continue the work of preparing the schedules of scientific and common names of commercial species of fish since these contributed to the establishment of a common terminology.

The strengthening of the staff, proposed to further the work of standardization and to assist in the preparation of a series of

handbooks, was considered desirable. It was thought that these handbooks should be compiled wherever possible by the member countries and that the Organization would be mainly responsible for editorial work.

It was pointed out that work on terminology undertaken in the field of biology was important both to UNESCO and to the Organization and, while the latter should play its full part in this, it was essential that close contact be maintained with UNESCO in its development. The co-ordination of work in the classification of plankton was noted and considered essential to the development of the fisheries.

Fisheries Technology

The Conference fully endorsed the work carried out in fisheries technology, including the strengthening of the staff. The method of presentation of the work in this field was approved and recommended for wider adoption.

It was noted that since the last session of the Conference the gratifying results of the Congress on Fishing Boats held in Paris, and Miami, U.S.A., in 1953, had become fully apparent, and stress was laid upon the desirability of a second congress. If possible, this should be organized in three sessions in the Far East, America and Europe and it was agreed that the feasibility of holding it simultaneously with the proposed congress on fishing gear and methods should be examined. It was hoped that the Organization would be able to promote a permanent international body to co-operate in the improvement in the design of fishing boats. At the same time the Organization should continue to take all possible steps to ensure the adequate circulation of information on fishing boat design. It was recommended that the staff of the Organization be strengthened to assist in this work in future and that if, in the meantime, savings were achieved in other directions they should be allocated to furthering work in this field.

The proposed congress on fishing gear and methods was considered to be of the highest importance. It was particularly requested that, since many of those likely to benefit by the proceedings would be unable to attend such a congress, wide dissemination of the information arising out of it should be made in forms appropriate to fisheries workers at all levels.

The collaboration with UNICEF on technological problems in the manufacture of fish flour was noted and the continuation of this work during 1956 and 1957 was approved.

Fisheries Economics and Statistics

The Conference approved the strengthening of the staff in fisheries economics and hoped that this would permit further broadening of its activities. The Conference noted that the work was hindered by the scarcity of well qualified economists

conversant with conditions in the industry, and that this impeded the execution of projects in both the Regular Program and ETAP. The policy of employing on fisheries studies consultants from member countries already engaged on similar associated work was noted and highly commended as a method of accomplishing a great deal of useful work at a minimum cost to the Organization. This policy, moreover, assisted in focussing the attention of prominent economists and administrators on the problems of the fishing industries, and their assistance could be expected to make important contributions towards the solution of such problems. The pilot study on governmental services to the sea fish industry of Great Britain, at present being carried out in the United Kingdom, was considered to be useful both in itself and in setting a pattern which would be valuable when similar work was undertaken in relation to other countries. The Conference noted that until additional staff became available, work on economic appraisal in fisheries could be carried out on an *ad hoc* basis only.

It was considered that the publications of the Organization in fisheries economics were proving extremely useful to member nations, and particular mention was made of the FAO *Yearbook of Fishery Statistics*. It was recommended that standardization should be carried further and the Director-General was asked to draw the attention of member countries wherever possible to the most desirable forms in which statistical returns might be compiled so as to provide a useful basis of comparison with those of other countries.

Regional Activities

Asia and the Far East. In reviewing the fisheries work accomplished by the Organization, the Conference noted the consistent growth and development of the Indo-Pacific Fisheries Council over the past years. It felt that the work devolving upon the Secretariat in connection with the Council and the associated work in the Regional Office had now become so onerous that the Regional Office fisheries staff should be reinforced by an officer at an early opportunity.

One of the accomplishments of the Indo-Pacific Fisheries Council had been the strengthening of fisheries administration in the region. It was also considered that means should be found to develop leadership among communities of fishermen and that the appointment of wan additional officer to the Regional Office would strengthen these activities. At the same time it was recognized that, however many persons were attached to the Regional Office, specialized advice was required from Headquarters from time to time. Visits from Headquarters staff had proved extremely valuable and it was only regretted that very often these were of comparatively short duration. It was recommended that Headquarters' officers be assigned for longer periods to the Regional Office in order that they could the better cover the very extended

area and diversity of conditions in the region. For this reason the Conference welcomed the increased allocation for travel proposed for work in this field in 1956-57. It was felt that a prerequisite of expert advice was familiarization of the officer with local conditions in the part of the world in which he was working.

The attention of the Conference was drawn to the existence of certain publications, at present available only in Japanese, which might be of benefit to other countries where the fishing industries operated under similar conditions, but it was recognized that considerable difficulties in translation would have to be overcome before this work could be undertaken.

Europe and the Near East. The conclusion was reached that, as in Asia and the Far East, the work of the Organization generally in the area as well as that of the Secretariat of the Regional Council should be strengthened and extended. It was noted that the General Fisheries Council for the Mediterranean afforded the means of carrying out co-ordination of work being done by a number of governments and institutions in the region to ensure standardization wherever possible. The Conference fully endorsed this line of approach.

Latin America. It was hoped that the Director-General would pay full attention to the importance of promoting the production of fish flour in the Central American countries and that specialized advice and assistance would be given on this project wherever possible. The importance to this area of the survey of resources was stressed and it was considered that the early formation of the proposed Fisheries Council for Latin America (FCLA) might contribute much to fisheries work in that region.

Technical Assistance Activities

The Conference recorded its appreciation of the Technical Assistance work carried out in fisheries. Much of this field work was directed towards immediate practical objectives and, by its nature, required continual guidance from Headquarters. The Conference felt that there should be an appropriate balance between the effort put into the Regular Program activities and the Technical Assistance work since the latter was dependent upon the Regular Program and both programs were mutually beneficial. The expansion of the Technical Assistance Program was approaching the limit which could be conducted by the existing and proposed Regular Program and Headquarters Technical Assistance staff. It was recognized that recruitment of experts to fit the particular posts required by requesting countries presented difficulties peculiar to the field of fisheries.

The systems of training were specially mentioned and the Conference hoped that it would be possible to hold a training center on fish processing technology in Latin America in 1956.

Publications

The publications program for 1956-57 was approved, including the provision made for revising the *Handbook for World Fisheries Abstracts*. The Abstracts were considered to be most useful in both practical and research work. It was noted that the sales of fisheries publications had been substantially increased, thus fulfilling the hopes of earlier sessions of the Conference. In this connection, the system adopted in the past two years of sending out press releases to fisheries journals all over the world relating to items of particular news value contained in the Organization's fisheries publications was noted and it was considered that these releases served an extremely useful purpose, were widely used and should be continued.

International Congress of Refrigeration

The 9th International Congress of Refrigeration took place in Paris from 31 August to 8 September 1955. The opening session was held at the Sorbonne University under the chairmanship of Dr. H. Queuille, ex-Premier, President of the General Congress Committee and of the Executive Committee of the International Institute of Refrigeration. Apart from several plenary sessions dealing with the "Treatment of Air in Cold Chambers," "Precooling," "Education and Research Problems in Refrigeration" and "Refrigeration as regards Problems of Nutrition," the Congress meetings were divided into sessions of eight committees which met simultaneously. Of most direct interest to fisheries technologists were the sessions of Commission IV, which dealt with "Application of Refrigeration to Foodstuffs and Agricultural Produce." Two afternoon sessions were devoted to discussions on the refrigeration of fish.

E. Heen (Norway) acted as rapporteur for the papers covering the quality aspects of frozen fish, and the effects of freezing on the raw material, the methods of protection against dessication and oxidation of the frozen products, the effects of cold storage on deterioration of frozen fish, freezing at sea and the freezing of precooked fisheries products.

W. A. MacCallum (Canada) was rapporteur of the papers dealing with fish freezing equipment, both on land and aboard ship, the different types of freezing, including blast and brine and the use of refrigerated sea water to store fresh fish on board fishing vessels.

M. Sadorge (France) described a continuous freezer to freeze fish aboard ship installed in 1950 on a French trawler, and which has produced from 350 to 400 tons of frozen fillets annually since its installation.

G. Borgtröm (Denmark) discussed the sanitary and nutritional problems of modern refrigeration, including the role of psychrophilic bacteria in the cold storage of fish. He also presented a memorandum on the handling and storage of fresh fish.

A number of Japanese papers were tabled but not discussed. They dealt with the freezing of rainbow trout, squid meat, tunny, whale meat, swordfish meat, etc.

Commission V dealt with cold stores and ice making plants, with problems of water losses from stored products in cold chambers, construction of cold stores, with preparation, packaging and handling of frozen products, conditions of operation of cold stores and with water ice and dry ice, while Commission VII dealt with the construction of refrigerated vehicles, packaging problems regarding refrigerated transport and the operation of refrigerated vehicles.

Ample opportunity was given to the Congress delegates to visit cold storage plants in and near Paris, as well as manufacturing plants for refrigeration equipment, both during the Congress as well as on post-congress excursions. Official receptions were extended to the congress delegates by the Minister for Foreign Affairs, by the French organizations and associations of refrigeration engineering and trade, by the City Council of Paris and by the Chamber of Commerce.

Preprints of all papers presented at the Congress were distributed to the delegates at the beginning of each session. The full proceedings of the Congress will be published in English and French at a later date, and may be obtained from the International Institute of Refrigeration at the head office in Paris.

1955 Session of the International Permanent Commission on Canned Foods (CIPC) [1]

The 1955 session was held in Bordeaux, France, from 24 to 28 October. Attending were some 60 delegates and technical advisers from Algeria, Belgium, France, Western Germany, Italy, French Morocco, the Netherlands, Portugal, Spain, Sweden, Switzerland and the United Kingdom, and observers from Norway, the Tin Research Institute (U. K.) and FAO.

The meeting opened with a plenary session followed by sessions of the technical commissions, and a final plenary session. The technical commissions, two or three meeting simultaneously, included the following :

1. Scientific Commission
2. Commission for standardization of round cans
3. Commission for standardization of cans for fish
4. Commission for the regulation and definition of canned vegetables
5. Commission for the regulation and definition of canned tomatoes
6. Commission for the regulation and definition of canned fruits

[1] For 1954 Session see *FAO Fisheries Bulletin*, VIII (1), 48-50.

7. Commission for the regulation and definition of canned fishes
8. Commission for the regulation and definition of canned meats
9. Commission on cultivation of vegetables and fruits for canning
10. Commission on information and statistics
11. Commission on machinery and equipment
12. Commission for the organization of the Third International Congress of Canned Foods

The FAO observer attended the plenary sessions and that of the Scientific Commission, a joint session of the Scientific Commission and the Commission of Information and Statistics, the session of the new Commission on Cultivation and the Congress Commission.

During the opening plenary session it was reported that Italy had joined and that Argentina had rejoined the CIPC.

Under agenda item " Relations with International Governmental Organizations " the possibilities of a closer co-operation with the Organisation for European Economic Co-operation (OEEC) were debated. It was reported that the President of the CIPC, Mr. R. V. Manaut, had been chosen chairman of the Food Industries Committee (CIA), newly established by the Industrial Council for Europe (CIFE), which is a sub-group of the OEEC. CIPC has already obtained a " specialized consultative status " with FAO. How CIPC could strengthen its collaboration with international organizations was discussed at some length as it was felt that CIPC had a certain responsibility informing and advising and, if necessary, criticizing work being planned by such organizations in canning and related fields. As examples, projects were mentioned involving technical advice on whether freezing or canning would be the most economic solution to a food preservation problem, and up-to-date information on the use of food additives (colors and preservatives) in modern canning.

The latter example was of high actuality as the CIPC were concerned about the newspaper articles which had appeared after the Joint FAO/WHO Conference on Food Additives, held in Geneva in September 1955. This was the object of a detailed discussion in the joint session of the Scientific and the Information Commissions.

Scientific Commission

The Commission was informed that the proceedings of the colloquium on Bacteriological Definition of Preserved Foods had been published in *Annales de l'Institut Pasteur de Lille*, Vol. VII (1955), and in *Ier Symposium international de bactériologie alimentaire*, Editions Médicales Flammarion, 26 rue Racine, Paris.

This question of bacteriological definition will also be dealt with in the forthcoming meeting in Ostend, Belgium, organized by the International Union of Microbiology (Prof. Dr. Butiaux, Lille, France).

The previously announced publication on the chemical preservatives permitted and used in various countries, was at the printers at the time of the meeting.

A monograph on the food colors permitted in various countries was placed before the meeting. It will soon be made available to a wider forum.

Commission on Cultivation of Vegetables and Fruit for Canning

The Commission agreed that the main problem was pasticide residues. It was stated that Dr. Borgström, Sweden, would present a paper to the CIPC Congress in Rome in September 1956, on pesticide residues and other "unintentional food additives," covering all food products, not only fruit and vegetables.

Commission for the Organization of the Third International Congress on Canned Foods

This Congress will take place in Rome from 24 to 28 September 1956 and will be combined with a visit to an international machinery exhibition in Parma, where it is planned to show modern canning machinery and equipment. The Italian delegation is responsible for the practical arrangements and an announcement will be issued shortly.

Commission for the Regulation and Definition of Canned Fish

It was announced that this Commission would undertake the compilation of information about international customs regulations and legislation for the trade in canned fish.

After the meeting a press release was issued stressing that modern canning does not employ chemical preservatives or coloring matters.

Permanant Commission of the International Fisheries Convention 1946 [2]

The Fourth Meeting of the Permanent Commission set up under the International Fisheries Convention 1946, took place in London from 13 to 16 September 1955. Delegates attended from all the 13 member countries, namely, Belgium, Denmark, France, Federal Republic of Germany, Iceland, Ireland, the Netherlands, Norway, Poland, Portugal, Spain, Sweden and the United Kingdom. Observers were present from the International Council for the Exploration of the Sea, the International Commission for the Northwest Atlantic Fisheries, and FAO.

Discussions centered mainly upon industrial fisheries, the minimum size of mesh of trawl nets, and the arrangements for enforcing the previsions of the Convention.

[2] This report is taken from the press release of the Office of the Permanent Commission, London. For a report of the Third Meeting see *FAO Fisheries Bulletin*, VII (3), 125-27.

It was agreed that the provision whereby any catch not destined for human consumption (i. e. " industrial fisheries ") may contain up to 10% of undersized fish of species which the Convention protects, should continue until May, 1958, in order to allow further time for the International Council for the Exploration of the Sea to report on the problem.

The Danish delegation brought to the notice of the Commission the considerable industrial fishery for sand eels (Ammodytes) which has developed over the past two years in Denmark. The Commission agreed to amend Article 6 of the Convention to include sand eels in the list of species exempted from the minimum size of mesh provisions of the Convention.

The Commission considered the results of experiments on the relative selectivity of light and heavy trawls and studied also the effects of the prescribed minimum mesh size for trawls in the southern part of the Convention area. They set up an *ad hoc* scientific committee to review available information and to advise them on minimum mesh sizes and minimum size limits for fish and if any changes were required. Two interim measures were decided upon : firstly, that the 75 mm. minimum mesh should remain unchanged for a further year, i. e., until April, 1957 ; secondly, that trawl nets made of single twine and containing no manila or sisal might have a minimum mesh size of 5 mm. less than that applicable to other trawl nets. The International Council for the Exploration of the Sea is to be asked to advise on a more detailed definition of a light trawl.

Arrangements for ensuring the uniform enforcement of the provisions of the Convention were fully discussed. The Commission resolved to appoint an officer to visit those member countries which might so desire, in order to advise upon the enforcement of the Convention ; and it was also decided to recommend to all contracting governments that they should consider the desirability of taking steps to enable them to deal with the problem of fishing vessels of other countries entering their ports while contravening the provisions of the Convention.

The Commission will hold its next meeting in London, starting 8 May 1956.

International North Pacific Fisheries Commission

At the Tripartite Fisheries Conference in Tokyo, 5 November to 14 December 1951, representatives of the United States of America, Canada and Japan, drafted the International Convention for the High Seas Fisheries of the North Pacific Ocean, for the purpose of " ensuring the maximum sustained productivity of the fisheries resources of the North Pacific Ocean , " and agreed that each of the Contracting Parties assume an obligation " to encourage the conservation of such resources. " To this end they agreed that an international commission should be established " to promote

and co-ordinate the scientific studies necessary to ascertain the conservation measures " required to secure their objectives, and to commend such measures to the contracting parties. The Conference then adopted a resolution requested that the United States of America, as soon as convenient after entry into force of the Convention, call the first meeting of the proposed Commission. The Convention entered into force on 12 June 1953, and thereafter, in accordance with the terms of the resolution, the United States invited the Governments of Canada and Japan to meet to establish a North Pacific Fisheries Commission.

Since the coming into force of the Convention, the Commission has met three times, in Washington in February 1954, in Vancouver in October 1954, and in Tokyo in October/November 1955. The report of the Commission's first meeting, published in Washington, presents the Commission's decisions of that meeting, including a statement from the Committee on Biology and Research, on the research required for the Commission's work. This first report also published the Convention, Rules of Procedure and Financial Regulations of the Commission. The Report of the First Annual Meeting, which was published in Vancouver, the headquarters of the Commission, carries reports from the Executive Director and from the Committee on Biology and Research.

The Commission has now started publication of a series of bulletins. The first, which appeared in June 1955. contains five papers, entitled :

" The Pacific Salmon of the Canadian Pacific Coast "
" On the Salmon in Waters Adjacent to Japan "
" A Brief Review of the Salmon Fishery in the Aleutian Islands Area "
" The Pacific Herring along the Pacific Coast of Canada "
" Oceanography along the Canadian Pacific Coast "

These are reviews summarizing current knowledge on the various subjects and presenting bibliographies of the relevant literature within the limited subject field.

1955 Annual Meeting

The Meeting was preceded by a week of meetings of its Committee on Biology and Research, during which the Japanese, Canadian and U.S. research programs in the area were discussed, progress of the past year reviewed, and plans for future co-operation formulated. Arrangements were made for co-ordinated operation of research vessels for distribution studies and sampling of salmon, exchange of salmon scales for checking age determination methods, standardization of length measurements, and other joint biological works. The statistical requirements of the Commission were discussed, also developments in oceanographic studies in the region, and in tagging methods. The discussions of the Commission itself were concerned largely with matters of procedure and

much ground was cleared for future effective action concerning its objectives. FAO was represented at the meeting by an observer.

The Commission will meet next in Seattle, U.S.A., in November 1956. There will be an interim meeting of the Committee on Biology and Statistics in Hawaii in February 1956.

International Council for the Exploration of the Sea (ICES)[3]

The 43rd Statutory Meeting of the Council took place in Copenhagen, Denmark, from 24 October to 1 November 1955. The meeting was attended by its honorary president, Dr. K. A. Andersson, by 27 delegates representing 13 countries, and by 85 experts from these countries. Observers were present from the Australian Scientific Liaison Office, London ; the Fisheries Research Board of Canada ; the General Fisheries Council for the Mediterranean ; the International Commission for the Exploration of the Mediterranean Sea ; the International Commission for the Northwest Atlantic Fisheries ; the International Whaling Commission ; the Meat and Fish Office, Ankara, Turkey ; the Office of the Permanent Commission of the International Fisheries Convention 1946 ; the U.S. Fish and Wildlife Service ; the U.S.S.R. and Poland ; and FAO (represented by Mr. M. Girard, Dr. G. L. Kesteven, and Mr. H. Kristjonsson). Guests were present from Denmark, the United Kingdom and the U.S.A. The Council elected Prof. H.U. Sverdrup as its President for the following year, Dr. A. V. Tåning as First Vice-President, and Dr. E. Leloup, Dr. J. Furnestin and Mr. A. J. Aglen as vice-presidents.

The Sub-Committee (of the Distant Northern Seas Committee) on the Faroe Question was dissolved, as was also the Sub-Committee on the Standardization of Zooplankton Methods. The Council resolved to hold a Special Scientific Meeting on Herring " Races, " commencing Thursday, 27 September 1956, thus preceding the 44th Statutory Meeting which will start in Copenhagen on Monday, 1 October, 1956.

At the meeting of the Distant Northern Seas Committee, Dr. G. L. Kesteven presented a Note on the Fisheries Resources of the ICES Area, prepared by FAO. The Committee received the information on the subject with great interest, and recommended that all relevant information of the kind indicated should be given to FAO whenever possible, though it was emphasized that man's knowledge as to the size of the living aquatic resources, even in the much explored North East Atlantic, is very fragmentary and that a collaboration between the ICES and FAO should be of a long-term nature. It is considered that a survey of fisheries resources would be much helped if FAO could implement the recommendation of the Consultative Committee, at the 1954 meet-

[3] For a report on the 42nd Meeting, see *FAO Fisheries Bulletin*, VIII (1) : 45-46.

ing, on the desirability of setting up a world fishery bibliographic and abstracting service.

In consequence of the lecture by Prof. Fontaine on " The Necessity to Protect the Oceans against the Dangers of Radio-active Pollution, " the following recommendation was submitted to the Bureau for transmission, through the usual diplomatic channels, to the member states :

> The ICES urge that the deposition in marine waters of waste products from atomic industries should be a matter for international study. The Council strongly recommend that any commission or commissions attending to the disposal of the atomic waste products should comprise scientists engaged in the study of physics, chemistry and biology of the sea, as well as in sub-marine geology.

The Council had many technical papers before it, which were read at meetings of the area and subject committees. Particular interest was shown in the communications from the U.S.S.R., and the announcement of that country and Poland joining the Council was received with pleasure.

Considerable interest centered on the papers presented to the Committee on Comparative Fishing, and in the discussions of these papers which dealt with the design, operation, selectivity and efficiency of fishing gears. This committee was informed by H.Kristjonsson of the progress made by FAO in its plans for a World Congress on Fishing Gear and Methods.

Indo-Pacific Fisheries Council [4]

The Indo-Pacific Fisheries Council held its 6th Meeting in Tokyo, Japan, from 30 September to 14 October 1955, under the chairmanship of Mr. Boon Indrambarya, Director-General of the Department of Fisheries, Bangkok, Thailand. Delegates and Advisers attended from the 16 Member Governments. Observers were present on behalf of the Governments of Portugal and New Zealand, and five international organizations. The observer for Portugal communicated to the meeting his Government's intention shortly to adhere to the Council's Agreement. FAO was represented by Dr. C. Miles, Dr. T. J. Job, and C. L. Coltman of the FAO Regional Office for Asia and the Far East, and by R. H. Fiedler, J-O. Traung and S. J. Holt of Headquarters.

After some amendments to its Agreement and Rules of Procedure, the Council made an extensive review and evaluation of its past work, and arrangements for continuance of this work. A wide discussion took place on technical assistance generally, and in particular on the training centers organized under the Expanded Technical Assistance Program. The Council especially recommended the development of international collaboration in research on Hilsa and Rastrelliger with the assistance of ETAP,

[4] For 5th Meeting, see *FAO Fisheries Bulletin*, VII (2), 77-78.

nd urged the holding of a Training Center in Fisheries Adminis-ration in 1956 or 1957.

Technical Committee I

The Council recommended that the Indo-Pacific Fisheries Year hould be observed in 1957/58, concurrently with the Internation-l Geophysical Year. There was discussion on the problems of nland fisheries, notably pollution and the control of weeds, and he development of research on Chanos, soil composition in rela-ion to productivity of fish ponds, and the use of various important pecies. In respect of marine fisheries, the Committee had discus-ion on tuna, Rastrelliger, and several aspects of the biology of narine fish. Finally, the Committee considered questions related o plankton, seaweeds, crustacea and taxonomy.

Technical Committee II

There was extensive discussion on craft and gear, food techno-ogy and socio-economics, marketing and statistics.

During the meeting, nine fisheries films were shown. There ere excursions, by courtesy of the Japanese Government, to the okyo Metropolitan Fish Market, the Tokai Regional Fisheries esearch Laboratory, The Tokyo Municipal Fisheries Experimen-al Station, the Tokyo University of Fish, and the Misaki Fishing ort. Two optional post-conference, five-day inspection tours were lso arranged, the first to Tokyo-Bentenjima-Kashikojima-Nara okyo, the second to Tokyo-Kyoto-Kashikojima-Nagoya-Gamagori-hizuoka-Tokyo.

Dr. N. K. Panikkar, Chief Research Officer, Central Marine isheries Research Station, Mandapam Camp, S. India, was elected hairman for the ensuing period, and Mr. D. J. Rochford was elected ice-chairman.

The 7th Meeting of the Council will take place in Bandung, ndonesia, in May 1957.

Meetings on Marine Science convened by UNESCO

The first of the four UNESCO meetings of interest to fisheries vorkers and convened in the autumn of 1955, was held on 17 and 8 October 1955, in São Paulo, Brazil. This, the second regional neeting of experts in marine biology, oceanography and limnology o be convened by the Center for Scientific Co-operation in Latin America [5], was attended by 12 experts from seven countries. The neeting was held concurrently with a symposium on plankton and vith a training course in marine biology, attended by 20 parti-ipants from various Latin American countries. Papers were pre-

[5] For a report on the first meeting, held in Concepción, Chile, 15 to 17 Septem-ber 1954, see *FAO Fisheries Bulletin*, VIII (1) : 48.

sented on the training of personnel, research and symposia on spe cific problems in marine biology, international oceanographic ex peditions, publications, and the establishment and operation o marine laboratories. Recommendations on these subjects wer made for communication to UNESCO.

A regional meeting of representatives of Marine Science In stitutes in the Indo-Pacific area also took place on 18 October This was convened immediately after the meeting of the Indo Pacific Fisheries Council, and was attended by representatives o institutions of 13 countries in the region, including Hawaii (U.S.A. and of the World Meteorological Organization, the International Council of Scientific Unions, the Indo-Pacific Fisheries Council and FAO. Dr. Hidaka, of Japan, was elected chairman. Thi meeting reviewed, country by country, the existing and proposed research projects on oceanography in the region, and formulated recommendations on training facilities in both the fundamental and the applied sciences, provision of fellowships and travel grants, close co-operation in designing programs with interna tional fisheries organizations, and support of the project fo an international survey program in the equatorial Pacific region (" Equapac ").

The regional meeting was followed (19-22 October) by a sym posium on physical oceanography, convened in three sessions, deal ing respectively with instrumentation (convened by Dr. Böhnecke Western Germany) ; circulation (Dr. Deacon, United Kingdom) and information (Dr. Revelle, U.S.A.). Nearly 50 persons attended and there was a very lively discussion of the total of 37 papers submitted.

On 24 to 25 October the Interim Advisory Committee on Marine Sciences met in Tokyo to discuss possible action by UNESCO in this field. [6]

Recommendations were made for submission to, and consid eration by, the Director-General of UNESCO, concerning the areas of the world where emphasis on oceanographic development should be laid, the support of existing institutions, and the desirable cha racteristics of any new institutions, the feasibility of operating in ternationally a research vessel to work primarily in unexplored areas also offering training facilities, training of personnel in general by fellowships, travel grants, training courses, and information services in aquatic sciences. Close co-operation, in all such ac tivities, with FAO, ICSU, and other international organizations was urged.

Between the meetings in Japan, an excursion was arranged to a plant producing salt from sea water, and to Misaki Marine Bio logical Station.

The next meeting of the Committee is expected to take place in the second half of 1956.

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[6] See *FAO Fisheries Bulletin*, VIII (3), 141-143.

n-American Institute of Geography and History (PAIGH)

The VI General Assembly of the Pan-American Institute of ography and History, a specialized Inter-American agency of the ganization of American States, was held in Mexico City, Mexico, om 25 July to 6 August 1955, together with the commemoration the 26th anniversary of the Institute. Simultaneously with the ssembly, the 7th Pan-American Consultation on Cartography, the h Pan-American Consultation on Geography, and the 3rd Pan merican Consultation on History, were held. Dr. B. F. Osorio-afall, Fisheries Officer for Latin America, represented FAO at ese meetings.

The agenda under the item " Oceanography " included a num-er of subjects pertaining to the Continental Shelf; the character-tics of oceanic waters ; and the means of employing science in ne study, utilization and conservation of the natural resources f the sea. However, the Assembly decided that discussion of ese matters should be deferred since the Organization of Amer-an States intends to call a special conference in 1956 to discuss ese items as they relate to Latin-American countries. From 1 to August, Dr. Osorio-Tafall participated in a number of meetings f the Committee on Hydrography and of the Sub-Committee on asic Natural Resources. In the latter, several problems relating the rational use of land, to marine biological research, and to ne utilization of fisheries resources, were discussed.

The closing ceremony of the Assembly took place on 6 August, 955. General R. Cañas Montalvo, former Director of the Geographical ilitary Institute of Chile, was elected president of the PAIGH n place of Dr. Randall (U.S.A.). The Statutes of the PAIGH were mended to provide for more flexibility and to allow for a large art of the budget to be devoted to field studies. A new General ommittee, composed of representatives of the 22 American overnments, was appointed. Among its responsibilities the se-ection of the Secretary-General has been given priority.

Conference on the Conservation of Living Aquatic Resources of the American South Pacific

This international conference, which took place in Santiago, Chile, from 14 September to 5 October 1955, was convened at the suggestion of the U. S. Government, to explore the possibility of establishing a Convention to regulate South Pacific fisheries of common interest to the participating countries. Attending were delegates from Chile, Ecuador, Peru and the United States of America.

The Conference terminated with the decision to adjourn *sine die* for " consultation with the respective countries. "

2nd Caribbean Fisheries Seminar [7]

The Caribbean Commission held its second biennial fisheries seminar in Port-of-Spain, Trinidad, from 26 to 29 September 1955. Mr. W. H. L. Allsopp, fisheries officer of British Guiana, was elected chairman and representatives attended from the Governments of France, the Netherlands, the United Kingdom and the United States of America, all of which are served by the Caribbean Commission. Observers attended from the U. S. Fish and Wildlife Service; the University of Miami, U.S.A.; l'Institut scientifique et technique des pêches maritimes, France ; l'Institut français d'Amerique tropicale, France ; and Trinidad Leaseholds Ltd. Mr E. F. H. de Vriendt, Secretary-General of the Caribbean Commission, represented the Commission and Mr. H. Rosa, Jr., from Headquarters, represented FAO.

The Seminar reviewed the action taken as a result of recommendations made by the Caribbean Fisheries Conference held in March 1952, and studied the recent fisheries developments in the area. Among other matters discussed was the exploitation of tuna fisheries resources in the Caribbean and the technical assistance being provided there by FAO. Some recommendations were made regarding the future activities of the FAO fisheries officer to be attached to the Commission.

Fishery documentary and informational films were shown during the Seminar and there were visits to the fish ponds of the Fisheries Division of Trinidad and the fish market of Port-of-Spain, as well as to the fishing cove of Carenage where improvements are being financed by that Division. Methods of fisheries statistics collection were explained to the visitors at the Division's headquarters.

It was agreed that another meeting of all the fisheries officers in the area should be held early in 1957.

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[7] For 1st Caribbean Fisheries Seminar, see *FAO Fisheries Bulletin*, VI (5), 208-9.

isheries Division Activities

ublications

The publications reviewed here are available from the FAO les agents listed on the inside back cover of this bulletin, or rectly from FAO, Headquarters, Rome, Italy.

AO Yearbook of Fishery Statistics 1952-53

954 Supplement (to Vol. IV, Part 1)

Vol. IV, Part 1 (Production and Craft) contains statistics r a series of years including 1953. A 1954 Supplement has w been issued, to bring up-to-date most of Section I (Catches d Landings), by adding landing statistics and by revising other ata, particularly for the year 1953, for many countries. These clude most of the principal producers, among them for the first me, the U.S.S.R.

Three of the summary tables of the Yearbook have been re-anged and expanded to cover data for 1938 and 1947-54; in ese tables FAO estimates have been used wherever other data ere not available. An additional summary table shows landings y groups of species and by continents for 60 reporting countries, counting for two-thirds of the estimated world total. Details r each of these countries are included in one series of tables, while nother series shows values of landings in national currencies, roken down by individual species and arranged by groups of spe-es. Corresponding U. S. dollar values are shown separately. rice : U.S. $ 1.00 or 5*s.*, or the equivalent in local currency.

The FAO Yearbook of Fishery Statistics 1952-53 (Vol. IV, art 2. International Trade) has now been published. Part 1 Production and Craft) was published earlier this year [see *FAO isheries Bulletin*, VIII (2) : 102-3].

Part 2 provides the reader with comprehensive statistics deal-ng with the import and export of fish and fish products in 110 ountries of the world. It is divided into 9 sections. The first ree contain the summary tables, based on the detailed data iven country by country in the last six sections.

These summary tables (Sections I-III) permit easy internation-l comparisons in terms of broad groups of fisheries commodities, hile reference to the country tables (Sections IV-XI) provides etails of the composition of the commodity groups and the ountries of origin and destination. Quantities are given in metric ns and, in the first three sections, the values are in U. S. dollars, hile national currencies are used in each of the national tables ppearing in the last six sections.

The commodity groups have been adjusted to conform as closely as possible to the Standard International Trade Classification, recommended by the Economic and Social Council.

The following are extracts from Table 1, which gives the estimated total international trade in fisheries products in 110 countries :

ESTIMATED TOTAL INTERNATIONAL TRADE IN FISHERIES PRODUCTS OF 110 COUNTRIES, ANNUAL AVERAGE, 1950-53

Commodity Groups	Value U.S.$	Net Product Weight	Estimated Live-weight Equivalent	Estimated Total Catch Entering International Trade
	Million	*Thousand metric tons*		*Percentage*
All commodity groups	797	2 754	5 600	(25)
Fish, fresh, chilled or frozen	163	617	950	10
Fish, dried, salted or smoked	157	620	1 900	45
Crustaceans, and mollusks, fresh, frozen, dried, salted, etc.	68	141	300	20
Fish in airtight containers	149	287	900	60
Crustaceans and mollusks in airtight containers	20	17	100	60
Fish, crustaceans, and mollusk preparations	2	9	50	30
Aquatic animal oils and fats, crude or refined	141	544	...	60
Aquatic animal oils, fats, waxes, etc., processed	26	82	...	...
Fish meals, fertilizers, etc.	38	360	1 400	30
Miscellaneous edible aquatic animal products	4	9	...	...
Miscellaneous inedible aquatic animal products	24	59	...	...
Miscellaneous aquatic plant products	5	9	...	...

Apart from the size and value of the international trade in fish and fish products, this table also shows that out of every 100 tons of fish caught an estimated 25 tons eventually are exported in one form or another. Comparing output and exports of particular preserved or processed commodities the percentage is as high as 60.

Part 2, like Part 1 of the Yearbook, is printed in English and French throughout, with Introduction and Notes in Spanish also. Price : U.S.$ 3.00 or 15*s*., or the equivalent in local currency, post free.

Fishing Boat Tank Tests

The first part of the FAO catalogue of *Fishing Boat Tank Tests* has come off the press. The catalogue contains the first 150 reports of resistance tests of fishing boat models made available to FAO by various testing tanks, shipyards, private persons, and from FAO's own files. The test results have been reduced to a

uniform concise presentation on loose-leaf sheets. An introductory text explains the form of presentation and indicates its use. A directory of testing tanks is included. Additional tests will be published from time to time so that they may be added to this loose-leaf catalogue. French and Spanish editions of the introductory text are to be published later.

Tank tests of models, long recognized to be essential in designing yachts and large merchant and naval vessels, are equally important in designing fishing vessels, the majority of which have under 100 ft. length over-all. The tests reveal the value of design and indicate possibilities for improvements in seaworthiness, seakindliness, fuel consumption, speed, etc.

Price : U.S.$ 10.00 or 50*s*, or the equivalent in local currency, which price includes additional sheets of resistance tests to be issued from time to time.

Report on the First FAO/ETAP International Fish Marketing Training Centre, Hong Kong, 11 July to 31 August 1954.

This document has now been published as *FAO Report* No. 404. It contains an account of the organization, curriculum and conduct of the Centre, a detailed description of the structure and operations of the Hong Kong Fish Marketing Organisation, and a review of fish marketing conditions in the Indo-Pacific Region with special reference to the participating countries, namely, Burma, Ceylon, India, Indonesia, Japan, Malaya, Pakistan, Philippines, Thailand and Viet-Nam.

Expanded Technical Assistance Program

Resumé of progress in fisheries as at 10 October 1955.

Forecast of 1956 Program

A provisional forecast based on countries' submissions to the Technical Assistance Board (TAB) indicates that there is likely to be an increase in 1956 over 1955 in the FAO technical assistance program in Fisheries. The provisional list shows 68 experts in Category I with 16 in Category II, and a further 8 listed for TAB approval, funds permitting, making a possible grand total of 92 experts. In addition, 5 training centers are under consideration, of which at least two are likely to take place in 1956. This program is subject to revision and confirmation by the Technical Assistance Committee (TAC) and TAB during their meetings in the last weeks of 1955.

Brazil. W. E. Ripley (U.S.A.) marine fishery biologist, is continuing his program of work on an assessment of marine fish resources ; this will not have been completed by the end of 1955 when he is due to return to his post with the California Division of Fish and Game ; a successor will be found to continue his work

in Brazil. Incidentally, he has demonstrated the use of a more efficient otter board to trawl fishermen.

R. E. Lee (U.S.A.), fishery engineer, has had assigned to him by the Government a new 8 m. fishingcraft which is undergoing trials; the construction of an 11 m. craft is far advanced. Mr. Lee is making preparations for outfitting both vessels for experimental fishing over a wide area from Recife, particularly for tuna.

S. A. Beatty (Canada), fish processing technologist, has visited a number of research laboratories, working on the problems of fishery technology, in the States of Rio de Janiero and São Paulo: he has visited plants and installations where fresh and salt fish are handled, this being part of a study on the handling practices in the distribution of fresh, frozen and dried fish. He is also working on plans for a salt fish plant.

Dr. C. A. Torres Botelho (Portugal), fish processing technologist, is visiting fishing centers in the Amazon Basin and is based for the time being at Manaus; he is paying special attention to the dry salting methods used at these outlying fishing centers.

Burma. J. Alan Tubb (Australia), inland fishery biologist, has visited the Hlawga Inland Fisheries Station and has given a short course of in-service training and demonstrations to the field staff at the Station. He will be carrying out a general survey over the next six months, visiting several of the states wherever there are centers of inland fishery activity.

Caribbean Commission. Efforts are continuing to recuit a fishery specialist to advise the various territorial governments in the Commission area on problems of fishery administration, marketing and development.

Ceylon. Einar Kvaran (Iceland), marine engineer, has turned his attention again to the development of a motorized beach seine hauler, and is endeavoring to reconcile mobility of the apparatus with the robustness necessary to carry the stresses involved in "anchoring" the gear when hauling. He is also supervising the installation of the marine engines provided by Canada under the Colombo Plan.

Jon Saemundsson (Iceland), fishery engineer, has been helping with the refitting and installation of winches in two craft belonging to the Ceylonese Government, in which he will carry out two-boat trawling and purse seine work. He has also been prospecting at sea with the small 20-ft. Danish-built craft, in preparation for his expanded program.

Dr. S. W. Ling (China), inland fishery biologist, has carried out further field studies, especially at Gal Oya and in brackish water lagoons; it is hoped to establish a fishery station for brackish water studies. At the same time, work on fish fingerling production at the inland fisheries stations has been intensified against an anticipated increased demand from small pond culture operators. Dr.

ging has also prepared a course of lectures on "Pond Culture in Asia (outside Indonesia)" which he will deliver at the International Training Center on Inland Fisheries and Fish Culture, to begin at Bogor, Indonesia, on 31 October 1955.

Chile. Charles Olesen (Denmark), master fisherman, is demonstrating mechanical hauling of long lines in even deeper water. Local fishermen at several different places have shown interest, being impressed with the possibilities of powered line-haulers. Mr. Olesen has been working gear down to 300 fathoms. Some local fishermen, under his guidance, have adopted nylon bottom-set nets for hake (merluza), and are also having some success with new trolling gear.

N. P. Hansen (Denmark), fish handling technologist, has supervised the construction of two more fish smoking ovens at fish processing enterprises the owners of which were impressed by his previous work.

Professor J. N. Bahamonde, FAO/ETAP Fellow in marine fishery biology, has completed his course of studies in Norway and is working for a few weeks in Denmark before returning home.

Colombia. Dr. V. Paz-Andrade (Spain) fishery economist, visited Rome from 7 to 25 September 1955 and completed a draft of his final report. This report is under review and, when compiled will be communicated to the Government.

Costa Rica. Martin Burkenroad (U.S.A.), shrimp biologist, paid a brief visit to Costa Rica from Panama to discuss his program of work in Costa Rica to be carried out during a longer visit in 1956.

Curação (Netherlands Antilles). T. W. Burdon (U.K.), fishery consultant, visited Rome from the 14 to 21 September to complete an interim report on the fisheries situation in Curação. He is unlikely to revisit the Netherlands Antilles as planned this year, but may be asked to undertake a program of demonstration fishing for pelagic fish in near waters in the spring of 1956 with a vessel provided and manned by the Government.

Denmark. The International Training Centre for Fishery Administrators opened in Copenhagen on 29 August, and closed on 8 October, 1955. A full report is found on pp. 23-26.

Ecuador. Karsten Hydal (Denmark-Faroes), fishery technologist has been working on plans for drying, salting and freezing plants at Manta, and is studying the technological problems of salting and drying Pargo, brine-salting Pinchagua and preparing animal feed from mixtures of graxe, cooked fish offal, rice bean and cotton seed cake.

D. Quiroga Rios (Spain), fishery economist, is assembling data for his study of marketing and distribution problems and is plan-

ning to institute a special statistical survey of marketing conditions at Manta.

G. Guzmann will work in association with Mr. Quiroga in Ecuador for some months before leaving to take up his fellow-ship. C.J. Mignone, under an FAO/ETAP fellowship in Canada, is maik ing a special study of preparations of frozen fillets and of fish drying and salting methods used commercially in Nova Scotia.

Egypt. K. W. Jensen (Norway), inland fishery biologist, is bringing to a conclusion the present phase of the work on fundamental productivity at the fresh water seaplane base near Alexandria. Mr. Jensen returned to his post in Norway at the end of 1955 and a successor is being recruited. Continuous observations on the phytoplankton and on bacteria populations are being maintained with parallel observations on the growth rates of edible fish ; difficulties in the interpretation of scale marking are being overcome.

Some ground work in advance of the arrival of a fishery statistician has been carried out by Dr. R. S. Koshal (India), agricultural statistician, FAO Economics Division ; it is hoped to recruit the fishery expert before the end of 1956.

Finland. It has been decided to split the water pollution assignment into two parts, one to be completed by Dr. F. Berger (Austria) in the autumn of 1955, more especially the chemical aspects of the problem ; and the other to be undertaken in the spring of 1956 by another expert on biological pollution problems, who will also make a study of fishermen's organizations in relation to these problems.

Guatemala and *Honduras.* S. Y. Lin (China), resumed duty in Honduras on 1 September, 1955. He will pay a short visit to Guatemala before the end of 1955 preparatory to a longer mission in that country in 1956. His interim reports on the inland fishery situations in both countries are under review at headquarters, and he is starting on a new program of work, including the establishment of experimental fishery stations, particular study of important local species of food fish and experimental pond culture of local fish.

Haiti. Martin Routh (U.K.), fishery engineer, has completed his survey of the existing state of the marine fisheries along the entire north coast, and should be able to cover the sections he has not already seen by October. FAO is supplying him with a 30-ft. fishingcraft with which he can begin practical work at sea, the program for which is nearing definition.

India. Three surf boats are being built at Cochin to the designs of Paul Ziener (Norway), naval architect, for demonstration use on the east coast of the State of Madras; surf landing trials should be completed before the end of the year. He has also been engaged in small fishingcraft design work for the State of

Andhra, and after the boat trials he will be visiting Orissa and Bombay once more, before his home leave, due in the spring.

G. Illugason (Iceland), fishery engineer, has continued his demonstration fishery voyage in the seiner *Samudra*, and is now working in the waters off Tellicherry with a small purse seine. trawling and gill-netting; he has worked successively at a number of fishing centers between Madras City and the southern point of India, and up the Malabar (West) coast. Independent fishermen are also using nylon gill nets, lent by FAO, with good success; the FAO-owned 22-ft. Danish boat, hired by a private fisherman, landed 5,473 lb. of fish during July, 1955, using gear and methods demonstrated by the expert.

The Government Fisheries Training Center at Satpati, Bombay, was officially opened on 9 October 1955 by Dr. Panjabrao Deshmukh, the Minister for Food and Agriculture of India. This training center was organized and is being conducted by Pierre Lusyne (Belgium), fisheries training specialist, and courses are given on fishing methods; elementary navigation; gear, both descriptive and operational; knotting and splicing and other seamanship work; net making; and the maintenance and operation of small marine engines. A remarkable feature of this school is the language problem; the lectures are given in English and simultaneously translated into Maratti, Hindi and Gujeratti. The students are working in their language groups and are acquiring a useful working knowledge of all phases of mechanized fishing, especially gill-netting, long-lining, trolling and trawling. The Government of India proposes to replicate this training center in other parts of the country, with further assistance from the expert, in 1956.

C. Ragnar Bjuke and Carl G. Bjuke (Sweden), fish harbor specialists, assumed duty in New Delhi on 30 September, 1955. They are surveying existing shore facilities for servicing small fishingcraft; and designing improvements where necessary at fishing harbors, river mouths and other landing points to enable mechanized fishingcraft to be more widely used, and landings from mechanized surf-passing boats made easier. Installations at the larger fish terminals are also being examined with a view to their improvement for more efficient handling and distribution of fish.

Six further fisheries experts are in process of recruitment for posts in India.

Indonesia. The International Training Center in Inland Fisheries and Fish Culture will open at Bogor on 31 October 1955. The center will be in the charge of its Director, Hasanuddin Saanin (Indonesia) and Associate Director, W. H. Schuster (Netherlands). Courses of lectures will be given by P. Chimits of FAO Headquarters, M. Huet (Belgium), E. G. Frey (U.S.A.) and K. H. Alikunhi (India); Dr. William C. Beckman (U.S.A.), FAO/ETAP expert from Syria, and Dr. S. W. Ling (China), FAO/ETAP expert serving in Ceylon. A special course of lectures on the economics of fish culture will

be given by Dr. Wylie Goodsell (U.S.A.) who has been visiting Rome, W. Germany, Israel, Calcutta, Singapore, Bangkok and Indonesia, collecting comparative data on this new field of study. The Indonesian Government are organizing extensive field trips in East, West and Central Java, and are contributing the services as lecturers of Dr. K. Vaas and Mrs. A. Vaas, Mr. Ahjar and Mr. Sachlan. The 20 participants will come from the following 11 countries and territories : Australia, Burma, Ceylon, Hong Kong, India, Indonesia, North Borneo, Pakistan, Philippines, Sarawak and Thailand.

Iran. H. Fibiger (Denmark), fishery engineer, has completed his assignment at Bandar Abbas where he has been succeeded by K. Frederiksen (Denmark), who will be continuing, through the winter months, the program of experimental fishing in the fishing vessel *New Hope*, initiated by the first expert, in conjunction with the Plan Organization of the Iran Government and ICA (formerly U. S. FOA).

Iraq. A. van den Eelaart (Netherlands), inland fishery biologist, has carried out further special observations on the migratory species of fish in the great rivers, the most important being three species of Barbus known as Gattan, Shabout and Bizz. H. A. Lynch (Canada), civil engineer, assumed duty in Baghdad on 5 October 1955 to advise on the measures which may be necessary for the protection of this migratory fish against the consequences of barrage and other water control construction programs.

Israel. B. Kagan will take up his fellowship in western Europe in fish canning technology, after having worked with the FAO/ETAP expert scheduled to visit Israel in 1956.

Liberia. Following the completion of the FAO/ETAP fishery mission, a fellowship has been awarded to James F. Cooper in trawling and fishing methods with lights for sardine-like fish ; he will visit Denmark and Italy.

Mexico. J. Fridthjof (Denmark) fishery economist, is at Headquarters completing a final report on his mission in Mexico. His work in promoting increased fish consumption, especially through education in the schools, has attracted a great deal of interest not only in Mexico but also in other countries with similar problems. Work in Mexico was concentrated in three states where experimental programs were launched, and arrangements were made for continuation of this work after the departure of the expert ; the work is likely to be taken up in other states of the Mexican Union.

Panama. M. Burkenroad (U.S.A.) shrimp biologist, while continuing field work on growth and replacement of important species of shrimp, has started a series of laboratory experiments

on individual growth rate under varying conditions of nutrition. There are indications of a relation between moult frequency, degree of expansion at moult, size, and nutrition. Results of these experiments will be used in interpreting field observations under natural conditions.

A fellowship has been awarded to J. L. Obarrio who has worked for the past year and a half in association with Mr. Burkenroad. Mr. Obarrio will study fishery biology with special reference to Crustacea, at the Gulf and Caribbean Fishery Institute, Coral Gables, Fla., and at the University of Miami, Fla., U.S.A.

Saudi Arabia. G. Ferrer (Philippines) fishery engineer, while awaiting delivery of the 80-ft. lift-net vessel being built for the Saudi Fishing Company in Egypt, has carried out a number of surveys and experimental trips in a 22-ft. motor boat; lights at night on certain occasions were found to attract considerable quantities of sardine-type fish; gill nets on good ground yielded good results, but were considerably damaged by large fish. On his last trip he trained local crews in working a pair-trawl from two similar 22 ft. craft known as *Samson* and *Delilah*; a considerable amount of dexterity was required in setting the gear, getting the warps to equal towing length, and exact station-keeping between the two craft. These demonstration operations will enable the pair-trawl to be used later when suitable trawling grounds are located.

Syria. Dr. William C. Beckman (U.S.A.), inland fishery biologist, started his mission with a rapid reconnaissance of both the marine and the inland fisheries of Syria. As regards marine fisheries, he has suggested a modest program of demonstration fishing with assistance from a TA fishery engineer. Among the problems identified during his inland survey has been the effects of drainage of a swampy area of some 30,000 ha. in extent at El Ghab on the Orontes river; this drainage and reclamation scheme will cause a loss in fish production, and the expert is examining the possibility of offsetting this in some degree by developing fish culture in ponds in this area; an experimental pond area has been selected. Meanwhile, he is undertaking a more detailed survey of the Orontes River with a view to improved management for increasing fish production, and this work will be extended to other natural waters where improved management may be expected to yield good results.

Dr. Beckman will also attend the International Training Center for Inland Fisheries and Fish Culture at Bogor, Indonesia, in November, 1955, and will lecture on "The Organization of Administration of Inland Fisheries" and on fish reproduction, and will take part in field demonstrations.

Turkey. Olav Easen (Norway), marine fishery biologist, now in the second year of his assignment, resumed duty after home leave on 2 September, 1955. He is undertaking voyages in the Government's research vessel *Arar* in the Black Sea and is accom-

panied by R. Gudmundsson (Iceland), fishery engineer. J. Einarsson (Iceland) fishery engineer, will be working in consort in the research vessel *Yunus*. It is hoped that the *Arar* with Asdic gear will locate fish and catch samples for identification and measurement analysis, while *Yunus* will follow up with experimental commercial type fishing. These vessels will be searching for palamut (bonito) and later hamsi (anchovy). *Yunus* will operate a purse seine and *Arar* may carry out, in addition, some trawling.

Dr. A. A. Dawson (U. K.) fish marketing specialist, is studying problems of fish marketing in Istanbul, including the selection of a site for a new fish market. At least three sites are being considered and the whole question of fish terminal facilities, market organization and layout is under review.

A fellowship has been awarded to Mr. I. M. Artuz in fisheries biology ; he will work for some months in Denmark.

Yugoslavia. Dr. A. W. Meschkat (Germany), inland fishery biologist, reported to Rome for briefing on 7 October, 1955. His duties during a four months mission will be to advise the Director of the Yugoslav Inland Fishery Institute, Belgrade, on methods of more intensive exploitation of natural stocks of fish in the lakes and rivers of the country, having regard to the effects of increased catches on these populations.

F. Grubisič is continuing his fellowship studies in Denmark where he is obtaining an intimate practical knowledge of the construction and operation of Danish trawls and trawling methods, in the course of which he is putting in plenty of time at sea. I. J. Tilič, after completing a study of the structure of fishery administrations and marketing methods in Denmark, the Netherlands and Western Germany, is completing his fellowship in Norway. S. I. Zupanovič has been awarded an FAO/ETAP fellowship in fisheries statistics, and after a brief period in Rome will receive training in the U. K. in commercial and biological statistics ; this will be followed by visits to Scandinavian centers and by a study tour in Mediterranean countries, during which current practices in each country will be examined with a view to suggesting means of increasing standardization in the collection and presentation of fisheries statistics.

urrent Fisheries Literature

lected Publications

WS 9.4 FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS UDC 341.13

MBIDGE, GOVE. *The Story of FAO.* D. Van Nostrand Co. Inc., 1955 New York. Illus., tables, app. 303 pp. In English. Price : U. S.$ 6.50 or £ 1.12.6*d.* (All royalties to FAO).

The record of the struggles and achievements — and the failures, — of a new type of international organization set up to combat the verty and hunger in the world. FAO is, indeed, a pioneer example the effort, through international co-operation, of men to meet a sit-tion which is as challenging as that faced in the past in opening up w countries.

It is ten years since FAO came into being at the Quebec Conference ctober 1945), when Lord Boyd Orr (then Sir John) was elected the st Director-General. The author is admirably qualified to write tout the Organization. He was FAO's first Director of Information, d since 1951 has been the Director-General's Regional Representative North America.

In writing his book, Mr. Hambidge was faced with a difficult and volved task. The activities of FAO have grown tremendously each ar, but he has not been overwhelmed by the mass of detail. He has vided the book into three parts : The Background, Genesis and Devel-ment, and Technical Co-operation. In Part I, he presents a simple cture of comparison between an average American farmer and an erage Egyptian fellaheen, and he uses this comparison to illustrate y and how the gap between the two must be narrowed. From there goes on to tell the story of the conception, birth, growth and devel-ment of FAO itself. The greater part of the book is devoted to tech-cal co-operation, describing work done in the field in Europe, Latin merica, Africa and the Near and Far East.

This is a comprehensive survey, telling of the policies and personal-es behind the development of FAO.

WS 9.10 MARINE BIOLOGY UDC 57

ÜDEMANN, DIETRICH. Das Tierreich. Vol. VII, Chordatiere. No. 2. Fisches 1955 [The Animal Kingdom. Vol. VII. Chordata. No. 2. Fishes]. *Sammlung Göschen* No. 356. Walter de Gruyter and Co., Berlin. 131 pp., illus., refs. In German. Price : DM. 2.40,

The sixth of 14 booklets to be published covering the whole animal ingdom. In the general section, a short account is given of the morpho-gy and physiology of the fishes shown. The second part is a survey of ie system of fishes. The good index makes it suitable to use as a dic-onary of German zoological terms. The systematic part gives German ommon names as well as the scientific names.

FWS. 1.0148 FISHES — PORTUGAL UDC 597 (46

Osorio, De Castro J. Glossário de Nomes dos Peixes [Glossary
1954 Names of Fish] *Publication* No. 20, Gabinete de Estudos da
Pescas, Lisbon, Portugal. 249 pp., bibl. Introduction in Portu
guese, English, French, Spanish, German and Italian. Note
in Portuguese.

An aid to rapid identification of the names of fishes and other aquati
organisms of commercial interest in continental Portugal, the Azore
and Madeira. In Part I, Portuguese names in alphabetical order, to
gether with scientific names, are listed ; most appropriate commo
names are indicated by heavy print. In Part II, the scientific name
are grouped by classes — Fishes, Reptiles, etc. - within which they ar
listed alphabetically, and a number reference is given to the commo
name. In Part III, later synonyms are given together with reference to
the full bibliography and indication of fishing area.

FWS 9.6 FISHES — ALGERIA UDC 597 (65

Dieuzeide, R., Novella, M. and Roland, J. Catalogue des poissons
1954 des côtes algériennes. II. Ostéoptéryguens [Catalogue of Fishes
off the Algerian Coast. II. Osteopterygii]. Station d'aquicul
ture et de pêche de Castiglione. *Nouvelle Série* No. 5, 1953.
Inspection Générale et Direction de l'Agriculture, Gouvernement
Général de l'Algérie, Algeria. 258 pp., illus. In French.

Book I appeared in 1952 and was devoted to dogfish and skate.
Book 2 is devoted to fish with bones or Osteopterygii.

This work is an inventory and guide to fish recognition off the Al
gerian coast and for the whole of the Mediterranean generally. C. T.
Regan's order of nomenclature is used. Each type is drawn or photo
graphed with a note giving the description, local and foreign names, geo
graphical distribution, where found, customs, size, fishing gear, and nu
tritive value.

FWS 1.017 FISHES — AUSTRALIA UDC 597 (94)

Ogilby, J. D. *The Commercial Fishes and Fisheries of Queensland.*
1954 Fisheries Branch, Department of Harbours and Marine, Bris
bane, Queensland. Australia 121 pp., illus., index. In English.

A second edition of the paper published in 1916 ; revised by T. C.
Marshall, and with 122 illustrations added to describe most of the fa
milies. There is an index of scientific and common names.

FWS 1.7 SHARKS, RAYS, ETC. — NORTH ATLANTIC OCEAN UDC 597.3 (261)

Bigelow, H. B. and Schroeder, W. C. Fishes of the Western North
1953 Atlantic. Part II. Sawfishes, Guitarfishes, Skates, Rays, and
Chimaeroids. *Memoir* No. 1. Sears Foundation for Marine
Research, Bingham Oceanographic Laboratory, Yale University,
Yale, New Haven, U.S.A. 589 pp., illus., index. In English.
Price : U.S. $15.00.

Part I, published in 1948, dealt with the Lancelets, Cyclostomes and
sharks of the western North Atlantic.

Part II maintains the standard format and presentation of the
first part. For each species there is a statement of study material, dis
tinctive characteristics, illustrated by a diagram, generally line or stip-

drawing, and the usual taxonomic description. There are notes color, size, developmental stages, habits and range. In addition to se headings there is information, for some species, on numerical abunnce, relationship to extralimital species, and relations with man. The rrents in the western Atlantic are discussed and there is a table of nonyms and references.

WS 1.0145 COD, HAKE, ETC. — U.S.S.R. UDC 597.5 (47)

ETOVIDOV, A.N. Various Species of Cod. *Fauna of the U.S.S.R.* 1948 *New Series* No. 34, (Zoological Institute of Academy of Science of U.S.S.R., Moscow). Vol. IX, No. 4. In Russian.

A systematic account of the families Moridae and Gadidae. An count of the morphology and anatomy of the groups is given as a basis classification, and the distribution and biology are described. Senty-one species and sub-species are described and illustrated. In adtion to distribution maps, half-tone drawings of about half the species d sub-species, and line drawings of the skulls from several aspects, ere is an extensive series of line drawings of vertebral columns.

WS 1.0145 HERRINGS, ETC. — U.S.S.R. UDC 597.5 (47)

ETOVIDOV, A.N. Clupeidae Zoological Institute of Academy of Science 1952 of U.S.S.R., *Fauna of the U.S.S.R., New Series* No. 48, Vol. II, No. 1. Moscow. In Russian.

A comprehensive systematic review of the family Clupeidae, introiced by a detailed discussion of the principles of classification, the ographic distribution and the biology of the group. This introductory iction has its own extensive bibliographic section covering both Rusan and non-Russian literature.

The family is divided into 11 genera for some of which distribution aps are given. For each of the 46 species or sub-species there is a andard taxonomic description with synonymy and a description, with tended bibliography, of distribution and biology. Each species, or b-species, is illustrated by a half-tone drawing, and stippled drawings e given of the skull.

WS 1.0149 HERRINGS, ETC. - BULGARIA UDC 597.5 (497.2)

TOIANOV, S.A. Black Sea Sprat, *Sprattus sprattus sulinus* (Antipa). 1953 *Bulletin of the Academy of Science*, Works from the Institute of Zoology, No. 3, Sofia, Bulgaria. 92 pp., illus., tables, bibl. In Bulgarian. Price : 8 LV (U.S. $ 1.20).

Deals with morphology, development, raciations and migrations. resents numerous tables on body-length, diameter, scalation, fin and ertebral counts, etc.

WS 1 FISHERIES UDC 639.2

OSEN, N. Havsfiske [Sea Fishing]. *Boken om Havet*, Sohlmans Förlag, 1954 Stockholm, Sweden. *3* (20) : 304-334. In Swedish.

A popular review of world fisheries with special emphasis on conditions in Europe, particularly Scandinavia.

FWS 1.0147 FISHERIES INDUSTRIES — GERMANY UDC 639.2 (4

LANDBOUW-ECONOMISCH INSTITUT. De Duitse Zeevisserij. [German Se
1954 Fishing] *Report* No. 215. The Hague, Netherlands. 76 pp., i
lus., tables. In Dutch ; summary in English, captions
Dutch and English.

Prepared by A.G.U. Hildebrandt with the collaboration of W.H. Th
Gieling, on the basis of studies made in Western Germany in 1953
reviews the problems of the German fishing industry, particularly wit
an eye to the lessons that might be learned from the German experienc
for the benefit of the Netherlands industry. After dealing with the co
sumption of fish in Western Germany, the distant water fishery, the fis
processing industry, the herring drift-net fishery, the near water an
inshore fishery, and the shrimp fishery are discussed and a brief refer
ence is made to the inalnd fisheries.

FWS 1.0144 FISHERIES INDUSTRIES — FINLAND UDC 639.2 (471.1

HALME, E. Kalamiesten niksikirja [A Book of Fishermen's Tricks]
1955 Werner Söderström Osakeyhtiö, Porvoo, Helsinki, Finland
395 pp., illus., diag., index. In Finnish.

Covers the knowledge and observations of both professional and
sporting fishermen in every field of fisheries in Finland. The obser-
vations include the reactions and behavior of different fish in different
conditions. Nearly all the fishing methods used in Finland are described,
and hints on their most effective and practical use given. Describes
several ways of caring for fishing waters, fish culture methods, and the
handling and processing of fish by fishermen. Some of the best meals
to be obtained from fish are included. One hundred illustrations de-
scribe the text.

FWS 1.6119 FISHERIES — GREENLAND UDC 693.2 (988)

HANSEN, P.M. AND HERMANN, F. Fisken og Havet ved Gronland [Fish
1953 and the Sea of Greenland] *Skrifter fra Danmarks Fiskeri-og
Havunder sogelser* [Papers of the Danish Fishery and Sea
Investigations] No. 15. I Kommission Hos. C.A. Reitzel. Co-
penhagen, Denmark. 128 pp., figs., illus., map. Charts., bibl.
In Danish.

A history of the Greenland fisheries, the biological investigations
and the various attempts to introduce modern methods and equipment,
including Chr. Venö's expedition, etc.

FWS 9.10 FISHERIES RESEARCH, BIOLO- UDC 639.2.001.5. (42)
GICAL — GREAT BRITAIN

GRAHAM, M., TROUT, G.C., BEVERTON, R.J.H., CORLETT, J., LEE, A.J.,
1954 AND BLACKER, R.W. Report on Research from the *Ernest Holt*
into the Fishery near Bear Island 1949 and 1950. *Fishery
Investigations* Series II, (Ministry of Agriculture, Fisheries and
Food. H.M. Stationery Office, York House, Kingsway, London.
W.C. 2) Vol. XVIII, No. 3, 87 pp., illus., tables, figs. In Eng-
lish. Price : 12*s*.6*d*.

The first report on English fishery research in the Arctic since the
reconstruction of the scientific staff after the 1939-1945 war. Arctic
fishery research carried on at all seasons of the year is a new venture

l was approached carefully by stages as described in the early part this report. Research was still in progress at the time of writing.

78 9.17 FISHERIES MANAGEMENT — CONSERVATION UDC 639.2.04

RIG, S. Methods of Exterminating Wild Fish in Ponds. *Bamidgeh*, 1954 *Bulletin of Fish Culture in Israel* (Department of Fisheries, Ministry of Agriculture, Agricultural Publications Section, P.O. Beit-Shean, Israel). Vol. 6, No. 1, pp. vii-xi, tables. In English and Hebrew.

The fish ponds in Israel are heavily infested with wild fish (Tilapia, fishes) which are detrimental to carp, since they rob the ponds of ural and artificial food ; create unfavorable conditions of life (over-wding, lack of oxygen, etc.) ; eat the carp's fry ; bring disease and rasites ; create additional work in separating them from the carp and gerlings.

The best means of preventing this is either to stop the wild fish ering the ponds, or to destroy them once they have done so.

As a counter-measure, with carp weighing between 30 and 50 g., ke, trout or blackbass, can be introduced into the ponds as in Europe. e water entering the pond could also be filtered and the wild fish fry maining could be exterminated. Finally, Rotenone could be used to ison the water coming from the source. The effect of the poison dis-pears between 24 and 48 hours after its introduction and the fish thus led are edible. By means of a sprayer 3 kg. per 1,000 m^3 can be roduced in sufficient quantities to cover the cubage of water present d that brought into the pond during three hours. Emulsified Rotenone ves the best results.

WS 1.3 FISHING — SALMONS, ETC. UDC 639.211

TERSON, ALVIN E. The Selective Action of Gill Nets on Fraser River 1954 Sockeye Salmon. *Bulletin* 5, International Pacific Salmon Fisheries Commission, New Westminster, B.C., Canada, 101 pp., figs., tables, bibl. In English.

Reports on a study made of the selective action of linen gill nets r size, age class, sex ratio and number of sockeye salmon, and gives e results of two years of experimental fishing with various mesh sizes gill nets.

WS 1.85 FISHING — CRUSTACEANS — SHRIMPS — PANAMA UDC 639.282(728.7)

URKENROAD M.D., OBARRIO, J.L. AND MENDOZA, C.A. La pesca del 1955 Camerón en Panamá [Shrimp Fishing in Panama]. *Revista de agricultura*, Panama, *13* (21) : 2-8.

A short account of the work of the National Fisheries Laboratory of anama, recently established with FAO assistance under the Expanded echnical Assistance Program.

WS 9.16 FISH CULTURE — SPAWNING UDC 639.3.03

IMÕES DE MENEZES, R. Hipofisação de Peixes na Prática de Pisci-1954 cultura [Hypophization of Fish in Fish Culture]. *Publicação* No. 2, Secção de Fomento Agrícola, Ceará, Av. dos Expedicionários 3442, Caixa Postal 223, Fortaleza, Brazil. 40 pp., illus., tables, bibl. In Portuguese.

Detailed review and bibliography on the induction of spawning in sh by the use of hypophysical extract, and the application of this tech-ique in fish culture.

MORTIMER, C.H. Fertilizers in Fish Ponds. Colonial Office, *Fishery*
1954 *Publication* No. 5, 1954. H.M. Stationery Office, York House, Kingsway, London, W.C.2. 155 pp., figs., tables, bibl., index. In English. Price : 25*s*.

Based on 351 bibliographic abstracts covering all principal publications on fertilization in fish ponds. The subject is considered under the following headings : General Works ; Construction and Care of Ponds ; Pond-muds ; Lime, Chalk and Limestone Fertilizers, pH, etc. ; Potassium Fertilizers and Sulphur ; Magnesium, Phosphate, and Nitrogenous Fertilizers ; Organic Manures ; Sewage ; Fertilization in Peaty or Acid Ponds ; the Effect of Manures on Fish Food ; the Direct Effect of Fertilizers on Fish ; Manuring of Trout Ponds.

Other Publications Received

DAVIES D.H. The South African Pilchard (*Sardinops ocellata*), Bird
1955 Predators, 1953/4. *Investigational Report* No. 18.

———. REPRINT FROM COMMERCE AND INDUSTRY, *Director of Fisheries, Division of Fisheries, Department of Commerce and Industries, Beach Road, Sea Point, Cape Town, Union of South Africa. 32 pp., figs., tables, refs. In English.

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS and
1954 UNITED NATIONS EDUCATIONAL SCIENTIFIC AND CULTURAL ORGANISATION. *Symposium on Marine and Fresh-water Plankton in the Indo-Pacific, Bangkok, Thailand*, 25 and 26 January 1954. Indo-Pacific Fisheries Council, FAO Regional Office for Asia and the Far East, Maliwan Mansion, Phra Atit Road, Bangkok, Thailand, and UNESCO, Science Co-operation Office for South East Asia, Djakarta, Indonesia. 111 pp., tables, figs. Price : S.U.$ 1.000 or 5*s*.

INDO-PACIFIC FISHERIES COUNCIL, *Indo-Pacific Fisheries Council Proceed-*
1955 *ings, 5th Meeting, Bangkok, Thailand*, 22 *January to* 5 *February*, 1954. *Section II and III*. FAO Regional Office for Asia and the Far East, Bangkok, Thailand. 226 pp., tables. In English, 1 paper in French. U.S. $ 1.00 or 5*s*.

SETTE, O.E. *et al.* Progress in Pacific Oceanic Fishery Investigations
1950-53. *Special Scientific Report : Fisheries* No. 116. Fish and Wildlife Service, Department of the Interior, Washington 25, D.C., U.S.A. 75 pp., figs., illus., tables, app. In English.

Ship and Boat Builder Annual Review 1955. John Trundell (Publishers)
1955 Ltd., Temple Chambers, Temple Avenue, London, E.C.4. 382 pp., illus. In English. Price : 30*s*.

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* We have been asked to notify readers that the distribution of reprints of *Annual Reports, Investigational Reports* and *Fisheries Bulletins* appearing in the journal *Commerce and Industry* may be expected approximately six months after publication of the journal, and further copies may be obtained on an exchange basis by application to : The Director of Fisheries, Beach Road, Sea Point, Cape Town, Union of South Africa.

lletin of Tokai Regional Fisheries Research Laboratory, Tokai Regional
954 Fisheries Research Laboratory, Tsukishima, Tokyo, Japan.
No. 7.

Ibid. No. 8 (Contribution A. Nos. 4 and 5) :

Contains a consolidated contents list for all previous issues of *Bulletin* (No. 1 was published in December 1950), also two papers ler the general heading of Fishing Gear and Methods. In Japanese, h English summaries.

ng Kong University Fisheries Journal, No. 1. Hong Kong University Press. 1954 Illus., tables. Annual

This Journal can be regarded as a continuation of the *Journal of the ng Kong Fisheries Research Station*, of which only three issues appeared ol. 1, Nos. 1 and 2, 1940 ; Vol. 2, No. 1, 1949).

The Hong Kong Fisheries Research Unit began work in September 52, although its staff was not brought up to full strength until the mmer of 1953, and its research vessel, the *Alister Hardy*, has been erational only since March 1954. The papers which appear in this t issue of the Journal are therefore necessarily no more than prelim- ry reports of investigations still in progress. It is intended to blish the journal annually for the time being to ensure continuity, t as the Fisheries Research Unit expands, publications may become re frequent.

The contents of this issue are as follows :

Li Kwan-Ming. " An Account of the Golden Thread Group Fishery in Hong Kong, and a Preliminary Note on the Biology of *Nemipterus virgatus* (Houttyun). "

Bromhall, J.D. " A Note on the Reproduction of the Grey Mullet, *Mugil cephalus Linnaeus*. "

Romer, J.D. " Notes on Sea Snakes (Hydrophiidae) Occurring in or near Hong Kong Territorial Waters. "

Chiu, B.T. " Notes on the Marine Algae of Hong Kong. I. The Chlorophyceae. "

Ti Chow. " Preliminary Note on the Fresh-water Plankton of Hong Kong. "

Barker, D. " The Development of Fisheries Research in Hong Kong. "

Tubb, J.A. Notes : " Introduction of Tilapia to Hong Kong, " and " Giant Rays in Hong Kong. "

ternational North Pacific Fisheries Commission. *Bulletin* No. 1. 1955 Vancouver, B.C., Canada. Figs., tables, maps. (*See also* p. 38).

The contents of this first number are :

Foerster, R.E. " The Pacific Salmon of the Canadian Coast, " and " On the Salmon in Waters Adjacent to Japan. "

Atkinson, C.E. " A Brief Review of the Salmon Fishery in the Aleutian Island Area. "

Taylor, F.H.C. " The Pacific Herring along the Pacific Coast of Canada. "

Tully, J.P. " Oceanography Along the Canadian Pacific Coast. "

East Bengal, Government of. Directorate of Fisheries. *Report on t*
1955 *Fish and Fisheries of East Pakistan.* 15 pp., sketch map.

————. *Achievement of the Directorate of Fisheries, East Bengal,*
1955 *the Field of Fish Culture.* 11 pp., tables, sketch map. In Eng
lish. List of papers published in English and Bengali.

India *Administration Report of the Fisheries Department for the Yea*
1954 1952/1953. Office of the Director of Fisheries, Trivandrum
Travancore-Cochin. 11 pp. In English.

India The Norwegian Indian Project in Travancore-Cochin. *Repo*
1954 No. 2. The Norwegian Foundation for Assistance t
Underdeveloped Countries, Klingenberggaten 7, Oslo, Norway
37 pp. In English.

Rhodesia Department of Game and Tsetse Control. *Fish Farming i*
Northern *Northern Rhodesia Progress* 1952-54, Lusaka. 11 pp. In Eng
1954 lish. Price : 2*s.*

Sudan University College of Khartoum, Sudan. *First Annual Repo*
1954 *of the Hydrobiological Research Unit, July* 1953 *to June* 1954
23 pp. In English.

Taiwan Department of Agriculture and Forestry. *Taiwan Fishery Yearbook*
(Formosa) 1954 Edition. Provincial Government of Taiwan, Taipei. 129 pp
1954 In English and Chinese.